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Networking and Technological Learning in  
Small and Medium Scale Manufacturing Enterprises in Zimbabwe

Submitted in Fulfilment of the Requirements of  
the Doctor of Philosophy Research Degree

Development Policy and Practice

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## DEDICATION

This Doctor of Philosophy thesis is dedicated to my beloved wife Jesimen Tarisai Chipika, my two sons Tamiswanashe and Kundisoyashe, my daughter Rangariroyashe-Hannah and to my loving mother and late father.

All my love  
Husband, father and son

Stephen Chipika

## ABSTRACT

The overall aim of this thesis is to understand the relationship between technological learning and networking for small and medium enterprises (SMEs) engaged in manufacturing in Zimbabwe. This understanding is vital in order to facilitate a more purposeful mainstreaming of manufacturing SMEs into the national economy. The implications of the relationship between technological learning and networking are noted in the analyses, conclusions drawn and recommendations made for the strengthening of the development of manufacturing SMEs in the country.

A combination of quantitative and qualitative methods are used to analyse largely primary data collected principally but not exclusively from Harare. The quantitative data are analysed by applying progressive statistical analysis which involves the use of scatterplot, linear correlation coefficient, Chi-square test and regression analysis. Case study analysis which focuses on four firms with varying characteristics is used to develop an in-depth understanding of the association between technological learning and networking.

The research findings generally lend support to the hypothesis that 'small and medium scale light engineering firms that are strongly networked have a greater level of technological learning than poorly networked firms'. However, there are also qualifiers to this broad hypothesis, of which two are paramount. Firstly, in order to learn from networks a firm must know how to



learn. Secondly, while customer networks are consistently of high significance to firms, the same cannot be said of networks involving enterprise support organisations (ESOs). These qualifiers have important policy implications for the type of support that is offered to SMEs in Zimbabwe.

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## **ABBREVIATIONS AND ACRONYMS.**

ATPS	African Technology Policy Studies Network
AZIC	Association of Zimbabwe Consultants
BDS	Business Development Services
BESA	Business Extension and Advisory Services
CIED	Centre for Innovation and Enterprise Development
CSIR	Council for Scientific and Industrial Research
CZI	Confederation of Zimbabwe Industries
DR& SS	Department of Research and Specialist Services
ESAP	Economic Structural Adjustment Programme
GDP	Gross Domestic Product
GEMINI	Growth and Equity through Microenterprise Investments and Institutions
GoZ	Government of Zimbabwe
IBDC	Indigenous Business Development Centre
IBWO	Indigenous Business Women Organisation
IDRC	International Development Research Centre
IDS	Institute of Development Studies
ICTs	Information Communication Technologies
ITDG	Intermediate Technology Development Group
LE	Light Engineering
MIC	Ministry of Industry and Commerce
NGO	Non-Governmental Organisation
NORAD	Norwegian Agency for Development
NLTL	National Level Technological Learning
NUST	National University of Science and Technology
OECD	Organisation of Economic Cooperation and Development
RPED	Regional Programme on Enterprise Development
R & D	Research and Development
SAZ	Standard Association of Zimbabwe
SBP	Small Business Project in South Africa
SEID	State Enterprises and Indigenisation Department
SIRDC	Scientific Industrial and Development Research Centre
SMEs	Small and Medium Enterprises
SSA	Sub-Saharan Africa
SPSS	Statistical Package for Social Scientists

S & T	Science and Technology
TA	Technological Accumulation
TC	Technological Capability
TDIs	Technological Development Institutions
TL	Technological Learning
UNCTAD	United Nations Conference on Trade and Development
UNESCO	United Nations Educational Scientific and Cultural Organisation
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
WTO	World Trade Organisation
ZACE	Zimbabwe Association of Consulting Engineers
ZNCC	Zimbabwe National Chamber of Commerce
ZIMPREST	Zimbabwe Programme for Economic and Social Transformation

# **CHAPTER 1: BACKGROUND TO THE STUDY**

## **1.0 Introduction**

This thesis is based on research conducted between May 1999 and December 2002. It investigates technological learning among Zimbabwean small and medium enterprises (SMEs), in particular small scale light engineering firms. The study is pertinent, particularly because of the indigenisation policy of the Zimbabwean state, for political, economic and social reasons. The political rationale of this policy is that 'true' independence means 'true' independence from the white minority. The economic rationale of the policy is based upon the failure of economic reforms of the 1990s to create sustained economic growth and development and generally to make the economy more resilient. Socially, the indigenisation policy's focus is to create jobs both directly and through enhanced national wealth creation. Who owns, or benefits from, the economy, therefore is central to the indigenisation policy.

If we look to indigenisation of the large-scale, formal sector of the economy, however, we immediately note that the policy faces significant problems, at least in the short to medium term, because of the high barriers to entry. For this reason, indigenisation of the non-agricultural economy has tended to be associated with development of SMEs where the entry barriers are usually much lower. Indeed, the SME sector is increasingly receiving renewed focus from government and development agencies throughout the Southern African region. Recent work, among them through the International Labour



Organisation (ILO), United Nations Industrial Development Organisation (UNIDO), Food and Agriculture Organisation (FAO) and Southern African Development Community (SADC) projects has highlighted the potential of this sector. The small scale enterprise sector is increasingly being looked upon as having a tremendous capacity to provide a good part of the answer to the economic crisis, and in particular the unemployment crisis in the Southern African Region (ADB, 1997; CIED, 1996; JFA-PRESA, 2000).

Although the entry barriers for SMEs may be low, they face significant challenges of their own if they are to make a sustained and significant contribution to, and therefore be the backbone of, an indigenised economy in Zimbabwe. In particular, the small scale manufacturing sector incorporating the light engineering sub-sector, had been expected by development practitioners to offer an alternative model capable of transforming the Zimbabwean economy on a sustainable basis, generating the much needed employment and alleviating poverty. This has not to date materialised to magnitudes required by a dynamic and outward looking economy (ITDG, 1995; Chipika, Chibanda and Kadenge, 2000).

Among the most important of the challenges facing Zimbabwean SMEs is their apparent lack of technological dynamism, which makes them uncompetitive when compared to the large-scale sector and foreign imports. One key challenge is their inability to supply large quantities of goods at a given time in view of their limited scale of production which is determined by a number of factors some of which are technological while others are not. For example, limited working capital hinders their ability to buy adequate quantities of raw materials from suppliers. On the demand side, SMEs in

Zimbabwe have a problem in that they tend to focus upon poorer market segments while failing to tap the more demanding and perceiving markets. This is partly accounted for by unfavourable state policies and poor support structures for SMEs in general.

The major technological and associated constraints facing Zimbabwean SMEs include:

- Poor equipment and low levels of technical skills (low skills formation);
- Inability to produce new and better products for more demanding markets;
- Narrow range of goods produced for the sector's customers which could be widened;
- Inability to compete with the large scale sector on product quality or price;
- Low capacity utilisation<sup>1</sup>. The current stagnation in the national economy, especially in the manufacturing sector has meant a reduction in capacity utilisation of existing plant and equipment, a situation which discourages investment in new technology by both domestic and foreign firms.
- Duplication of activities (especially for micro-entrepreneurs);
- Sluggish growth (in terms of numbers employed and scope of operations);



- Low export capacity;
- Poor management (failure to engage professional managers and to implement sound management systems).

### **1.1 The context in which SMEs operate in Zimbabwe and the case for networking**

The lack of dynamism on the part of Zimbabwean SMEs which is characterised by the above constraints has a history, partly associated with the country's colonial legacy as well as the failure of macro-economic reforms since the 1990s. During the colonial era, Zimbabwean industry was established to process the output of white-owned agricultural and mineral enterprises and also to pursue the policy of import substitution for the white minority (Stoneman, 1981). Since independence in 1980, large scale enterprises have until recent years continued to dominate industries like dairying, edible oil extraction and processing, metal smelting and alloying, soap manufacture, sugar processing, textiles, flour production and animal feeds - controlling over 90% of commercially marketed output (ITDG, 1995). However, following the liberalisation of the economy during the past decade, modest inroads have been made on this 'cartel' with a growing number of indigenous players entering the agro-industrial sector.

The metal working, fabrication and maintenance needs of both large scale firms and smaller ones have traditionally been met internally or by a small

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<sup>1</sup> The rate of capacity utilisation is of paramount importance in a developing country like Zimbabwe because increased usage of installed plant capacity means that existing fixed capital assets yield greater output with only marginal additional investment costs.



number of large fabricators and machine shops. This represents *enclave development* because only a small number of large scale formal companies, mostly white owned, have benefited from this colonially induced arrangement which has excluded other potential players in the economy. These other players who have traditionally mainly operated as informal micro entrepreneurs have really been marginalized since for a long time they were not mainstreamed in the economy but rather operated from the peripheral areas without adequate facilities and infrastructure for commercially oriented productive activities. As result of the enclave development of the large scale formal sector, structural constraints especially in the formal industrial sector have militated against the realisation of a number of transformational possibilities, namely increased production *in situ*, (use of 'first generation' equipment instead of improved computer controlled machine tools), increased entry into new productive niches, and increased absorption of wage labour. The enclave development has also resulted in regulations that include taxation, labour, healthy and safety legislation, markets which have historically tended to be biased in favour of the large scale firms; and in particular economic reform policies, which tend to work against the plight of the SME sector.

In particular, there are several problems facing the light engineering sub-sector as a result of this historical enclave development of the large-scale formal sector. On one hand, large scale industry is modernising (CIED, 1996,1999; Kaplinsky, 1994; Zwizwai and Powell, 1991); on the other hand, the largely indigenous small to medium scale firms have not assimilated improved machinery, tools and associated knowledge and are in danger of

being left behind technologically (IDRC, 1996a). The most common explanation for the poor technological capability of these enterprises is that they lack resources, in particular finance to purchase new machinery and equipment, and raw material inputs. While this might be true to some extent indications are that there are a host of other factors that need to be unveiled to find more satisfactory explanations of this situation (Zimconsult, 1999).

Turning specifically to post-independence (post-1980) we need to divide between the pre-structural adjustment era of early independence (the 1980s) and the 1990s where the macro-economy was dominated by the first Economic Structural Adjustment Programme (ESAP, 1991-1996) and then the Zimbabwe Programme for Economic and Social Transformation (ZIMPREST, 1996 – 2000). The regulated and inward looking economic practices of the post independence and pre-ESAP era helped to foster the development of supply driven entrepreneurs in the country. During that period there were heavy restrictions on imports, including capital equipment, resulting in some companies having to cope using antiquated technology which was internationally uncompetitive. When the economy was opened up following the adoption of the Economic Reform Programme, Zimbabwean industry had to adapt to the new market demands in the face of competition from commodities produced in the international market. Many Zimbabwean firms, especially SMEs were struggling to survive and thrive, within an increasingly competitive market environment.

It had been expected that the second phase of economic reforms, officially called ZIMPREST, would take on board the fundamental issues relating to technological advancement and the re-invigorating of the domestic



economy, as well as social dimensions (Chipika, Chibanda and Kadenge, 2000; Government of Zimbabwe, 2000). Politically induced macro-economic instability derailed ZIMPREST, however, which never really took off as it was overtaken by a rapid socio-economic decline nationally. The situation became exacerbated by government's failure to secure the much needed international support, in particular from the World Bank and International Monetary Fund (IMF). The decline manifested itself in the political crisis which worsened from 2000 when the governing party realised that it faced its biggest challenge since independence in 1980.

In the meantime, the economic situation has remained gloomy. GDP growth, employment creation and industrial export response have continued to be weak. The expected foreign investment has over the years not been forthcoming in required magnitudes. This apparent failure has contributed to renewed hope in domestic investment and initiatives in Zimbabwe (Chipika, Chibanda and Kadenge, 2000), despite these themselves being a victim of the failing economy.

In a general way, much of this hope is justified. Within the more medium scale enterprises, there are many examples of promising indigenous entrepreneurs, many of them highly qualified, producing a diverse range of new products, both capital and consumer goods mainly targeted at the domestic market. With economic liberalisation, however, these enterprises had to face an acid test, whereby their products have had to face stiff competition from imported goods, which invariably are cheaper and are perceived to be of higher quality. While these entrepreneurs are exhibiting a very high degree of resilience to an unfavourable and tricky environment,

their enterprises seem to be in danger of annihilation (JFA-PRESA, 2000). There is an urgent need to understand better the process of technological learning and innovation within these enterprises - with a view to informing and influencing enterprise development policies, 'prime movers' and relevant support programmes.

While the colonial legacy and previous and present macro-economic policies provide important contextual factors for the lack of dynamism among SMEs, there are other, more direct, factors. Two of these -- lack of finance (for both working and fixed capital) and poor raw material supplies (inability to buy in bulk and cut costs) -- have already been referred to. A third concerns under-valuation of labour and self-exploitation, particularly in the micro-enterprise sub-sector, both in urban and rural areas. A fourth issue, which constitutes the major subject of this study, is the failure by SMEs to forge sustained relationships with a variety of major actors and potential collaborating partners. Such relationships which in this thesis are characterised as networks are considered globally to provide a major value adding role in the development of the enterprises, both in the medium term and in the long-term (IDRC, 1996b).

The so-called 'networking gap', which is the absence of a strong process of networking between firms, suppliers, enterprise support institutions and customers, is a notable constraint throughout much of Africa. Concern here relates to relationships which are more than just linkages (such as the market linkages with suppliers and customers), more it is to do with sustained cooperative arrangements which are consciously established over time to deal with particular issues. It is argued that lack of mechanisms



which involve networking, through which enterprises, especially SMEs might be encouraged to identify key bottlenecks and to innovate is at the root of technological under-development in African manufacturing enterprises in general (Mytelka, 1993, 1994; CIED, 1996). A number of scholars have linked the competitiveness of enterprises and their ability to innovate to their ability to network and forge linkages (Mytelka, 1993, 1997b; Humphrey and Schmitz, 1996; Hewitt and Wield, 1997). What this implies is that the extent to which enterprises are able to forge networks will determine how far they are able to accumulate knowledge and develop technologically. For instance, the importance of inter-firm networks and the capacity of firms to learn from each other on a sustainable basis through various forms of collaboration and the role of large firms in influencing the capabilities of small firms needs to be highlighted. Other types of network and their importance in the development process also need to be noted.

The above arguments need to be interrogated within the context of SMEs operating in Zimbabwe. To the extent to which they are considered important, a key question is whether it is indeed the case that networks are universally and unproblematically always correlated with technological advancement. Moreover, networking among firms in Zimbabwe has been little-studied, a gap which this thesis tries, at least partially, to fill.

## **1.2 The light engineering sub-sector**

This thesis, therefore, concerns the association, if any, between networking and technological dynamism among Zimbabwean SMEs. SMEs are, of

course, incredibly diverse in size and the work in which they engage. The sector as a whole is too diverse and ill-defined to be, in its entirety, the focus of analysis. This research has, therefore, decided to focus on a particular sub-sector, that of light engineering.

The light engineering sub-sector has been chosen because:

- The sub-sector itself is diverse in terms of its design capabilities and skills base. Some enterprises use up-to date machinery and equipment embodying a high degree of tacit knowledge engaging in the manufacture of high value products. These are the same enterprises that have to a large extent developed the capacity to manufacture capital and intermediate goods that other enterprises (for example, brick makers, furniture manufacturers, food processors and refrigeration manufacturers) require for their own manufacturing processes. Other SMEs in this sector, however, use fairly basic machinery and equipment, have low design capabilities and limited human resources capacity to produce high value commodities and are caught up in a vicious circle of low productivity.
- The characteristics and performance of the emergent indigenous owned light engineering firms producing a variety of goods are not well known or documented. Yet this sub-sector is perceived by many development practitioners to have tremendous potential to transform substantially the national economy by producing high quality intermediate inputs and capital goods for other sectors feeding into, for example, agro-processing and agriculture, mining and textile industries. These are sectors that are of strategic importance to the national economy. The sub-sector also



plays a central role in developing and reproducing technological capabilities in other enterprises. Capital goods or light engineering enterprises provide the basis for carrying out modifications, maintenance, repair and adaptations of imported as well as locally produced technologies. The sub-sector cannot adequately fulfil its potential, however, because of the problems highlighted earlier that face the SME sector in general, especially that of technological dynamism. This, moreover, is in contrast to the SME sector in some other African countries such as Ghana and Sudan (Jeans, Hyman and O'Donnell, 1990).

- Most current research and donor support focuses on small/micro scale enterprises for 'income generation', which is conceptualised socially as poverty alleviation through remunerated employment, rather than contribution to economic development. This recognition of the largely informal sector fails to cover a new category of enterprises, the promising entrepreneurs situated in between these informal sector micro-entrepreneurs and the more technologically advanced large scale sector and who are to be found mainly in the light engineering sub-sector. This 'middle ground' is economically and socially important however, because of its potential to contribute to sustained economic growth, as indicated above, and both social and economic development.
- The previous bullet point suggests that the light engineering sub-sector forms an *ignored* 'middle ground'. It is also an *unsupported* middle ground by enterprise support agencies, whether these are donor driven or indigenous. These SMEs are left to their own devices to a large extent.

The demands of their entrepreneurs have, therefore, gone largely unnoticed. This is the case despite all the growing rhetoric and politicisation of local economic empowerment and indigenisation. Moreover, in my experience, which is based on many years of research and practical field observation, donors and NGOs are not so interested in the technological dynamism for high potential productive firms.

- It brings into sharp focus the divide between the large scale formal sector and SMEs. If any sub-sector of SMEs should be dealing with the large-scale manufacturing sector as suppliers and customers, it is light engineering.

In sum, the sub-sector is potentially extremely important for Zimbabwean industrial development. This potential is not properly acknowledged, however, nor is it realised. Yet despite the contextual limitations, some firms are still able to exhibit technological dynamism, while others are not. It is because of this diversity and the fact that the sub-sector is frequently ignored by policy makers and donors that it is ideal for this study.

### **1.3 The focus of the research**

The major question that arises from the foregoing discussion relates to how technological dynamism might be increased or improved in the light engineering sub-sector, given that these enterprises are largely unsupported from the outside. Donors and NGOs are not so interested in them; the Zimbabwean state does not have resources to support them. One possibility is through developing their own networks – with suppliers, customers, peer

firms and other support structures. This is the key aim of this research, which is to explore the relationship between technological learning and networking for the selected small scale light engineering firms in the country.

More specifically, the research seeks to investigate the relationship between various forms of networks classified as follows:

- a. enterprise support;
- b. customer;
- c. supplier , and;
- d. firm-to-firm.

In short, the thesis investigates the extent and ways in which SMEs (light engineering firms specifically) in Zimbabwe network – the kinds of network they form, and whether such networking does indeed support technological learning.

### **1.3.1 Study hypothesis**

The **broad hypothesis** is that networking is important for technological learning within firms. Small and medium scale light engineering firms that are strongly networked exhibit a greater level of technological learning than poorly networked firms. Thus there is a positive relationship between technological learning and networking.

The study hypothesis, however, begs a number of questions about what is meant by the terms 'networks' and technological learning. With reference to firms studied, networking essentially refers to kinds of inter-organisational



relations which are more than simple market relations, and which incorporate a significant degree of cooperation. Technological learning relates to how firms learn with respect to their production systems and what they produce. The acquisition of knowledge which cannot be categorised as technological but has an important bearing on how technological knowledge is acquired, though not central to the study is also taken into account.

Chapter 2 explores in some detail through a literature review the concept of networks and major concepts associated with technological learning within small and medium scale enterprises.

Chapter 3 operationalises the concepts of networks and technological learning in the form of aggregated and disaggregated indices. It also explains the methods of data collection and the rationale of the combined quantitative and case study approach to the research.

The analysis is conducted in chapters 4 to 6. Chapter 4 steps back and examines the current mechanisms for promoting technological learning through enterprise support organisations and their apparent ineffectiveness in this. Chapters 5 and 6 analyse the respective quantitative (survey) and qualitative (case study) data, examining both the broad, aggregated relationship between networking and technological learning, and the relationships between particular kinds of networking and different aspects of technological learning. Finally, Chapter 7 draws together the main findings, together with some policy recommendations and suggestions for future research.

## **CHAPTER 2: LITERATURE REVIEW AND FRAMEWORK OF THE STUDY**

### **2.0 Introduction**

As indicated in Chapter 1, this thesis investigates the role that networking can play in technological learning among light engineering SMEs in Zimbabwe. Technological learning is important in firm development because it is the source of technological capabilities which in turn is the means of realising innovation.

Innovation, the commercial exploitation of new products and processes, is crucial to firm development and sustainability. The dynamic of capitalist development is such that if firms fail to innovate they will not develop and will ultimately fail. Thus, because innovation is crucial to the firm, so too are the technological capabilities and technological learning that realise it. Section 2.2 investigates further the literature on innovation, technological capability and technological learning.

Networking is investigated in this thesis as a source of firm learning, particularly of technological learning. As stated in chapter 1, networking is more than market linkages between firms. It implies forms of cooperative arrangement. Section 2.3 investigates the literature on networking and learning as it applies to firms.

There is a substantial literature on networking and firms. Many regions are covered by this literature, but there is comparatively little about low-income African countries such as Zimbabwe. In any case, much of the literature is general in nature and does not adequately address the micro-dynamics and



processes of firm networking in relation to technological learning. It is this gap that this thesis contributes to filling in the context of Zimbabwe. The gap poses a number of questions for the research with which, in section 2.4, the chapter ends.

## **2.1 Technological capability, technological learning and innovation in manufacturing SMEs**

### **2.1.1 The importance of manufacturing SMEs to the economy**

The manufacturing sector as a whole is recognised by development practitioners, theorists and academics as playing a pivotal role in the process of technological development and industrialisation in any developing country (UNCTAD, 1994; Ndlela, 1999). Small scale enterprises in particular, represent a starting point for countries embarking on industrialisation, a process that is argued to be more likely to succeed and remain under local control than in the case of investment by multinational corporations (MNC) which are often foreign controlled (Cooke and Clifton, 2002). The old argument in support of SMEs that most large firms had their origins in small firms is no longer as important as the argument that a focus on small firms is emerging to be a most innovative approach with high transformational possibilities for both developed as well as developing countries. In developed countries like the UK, for example, SMEs now provide more employment and business turnover than large firms and public organisations combined (Cooke and Clifton, 2002 and 2000b). However, in many developing countries, including Zimbabwe, the situation that has emerged shows that SMEs, especially within the manufacturing sector still



need to grow and develop to a point where they can successfully compete or surpass large firms in terms of their contribution to the economy.

In a developing country like Zimbabwe, the lack of up-to-date statistics and the wide variation in the growth paths of small firms make it difficult to generalize about their contribution as a group to the economy and to the growth of total employment or output at any given point and time. There is actually some disagreement about the sectoral distribution of the activities of the SME sector in the country among various studies conducted. The GEMINI survey<sup>2</sup> found that unlike in other African economies, the Zimbabwean SME sector was dominated by manufacturing, which accounted for about 69 percent of the 845 000 establishments identified (Gemini Report, 1993). This of course includes owner operated micro-scale businesses most of which are operated from home. More recent estimates by the Business Extension Advisory Services (BESA, 1997), a local SME enterprise support organisation, show a much smaller share for manufacturing which is 20 percent. This estimate excluded a large number of the micro-scale businesses which were included under the GEMINI study. The latter study had a bias towards the truly small and medium sized enterprises, a category of enterprises that this thesis is mainly interested in. However, the study was too general to cover in any detail small scale light engineering enterprises.

### **2.1.2 Definition of SMEs for this study**

A wide variety of studies on small and medium enterprises show that there is no standard and uniform definition of an SME. The definition of SMEs is not the same in developing countries. For example, what is called an SME in Japan, Europe or the USA may not be classified as being so in an African context (JICA, 1998; SMIDO, 2004). The criteria used to define SMEs in many developing countries is varied and range from employment and turnover to value of assets and or production equipment and degree of sophistication of equipment and machinery used. The definitions which set criteria based on turnover or assets are rather problematic since most SMEs do not keep proper records of these (JFA – PRESA, 2000b). Moreover, SMEs referred to in this study are ordinarily labour intensive. As such, consideration with respect to the level of sophistication of equipment and machinery is not important in the study context. I therefore use in this thesis a definition based on employment.

Even within a single country like Zimbabwe there is a definitional problem of SMEs. The definitions vary from research to research. There is actually a wealth of definitions for SMEs in the literature. Rather than add to these, for the purposes of this study, 'SMEs' refer to enterprises which employ 5 to 100 workers, a definition which is widely accepted nationally, and to some extent in many parts of Southern Africa (JFA-PRESA, 2000b; JICA, 1998; Malawi Government, 2003; Liedholm and Mead, 1993). Enterprises that employ 4 workers or below (including the proprietor) are often described as micro-

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<sup>2</sup> This is a country-wide survey of Micro and Small Enterprises in Zimbabwe carried out by a United States of America based organisation, GEMINI. GEMINI refers to Growth and Equity through Micro-enterprise Investments and Institutions, which is based in Maryland.



enterprises or informal enterprises (JFA-PRESA, 2000b)<sup>3</sup>. The latter are not central to this study although some references are made to them.

### **2.1.3 Technological learning, technological capabilities and innovation**

Technological learning refers to any process by which the resources for generating and managing technical change (technological capabilities) are increased or strengthened (Bell and Pavitt, 1993). As stated above the interest of this study in technological learning is because of its relationship with technological capabilities and innovation: technological learning is a source of technological capability and technological capability enables innovation. The relationship is also circular, however, for the need to innovate creates a demand for technological capability, while for firms to learn technologically, a certain level of technological capability is needed.

Innovation entails the processes by which firms master and implement the design and production of goods and services that are new to them, irrespective of whether or not they are new to their competitors - domestic or foreign (Ernst, Mytelka and Ganiatsos, 1994, p. 5, 1998). As already stated, innovation is fundamental to enhancing firm competitiveness and value added growth. It is the means by which firms develop and sustain themselves in a competitive environment. More generally innovation is a fundamental mechanism for imminent capitalist development.

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<sup>3</sup> Informal enterprises refer to a variety of businesses which are often owner operated and are run either on a part-time or full-time basis. They are not registered legally like formal companies. They depend a great deal on the behaviour of individual owners a lot more than formal companies.



Furthermore, innovation is based on the continuous and incremental upgrading of existing technologies or on a new combination of them (ibid. p.5). These incremental changes, which can be big or small, formal or informal, are implemented by firms over time. In the case of light engineering, this is one technical area with a fair degree of sophistication relative to other sectors in which SMEs in Zimbabwe are engaged (ITDG, 1995). This is mainly so because of the perceived requirements to innovate within this area if SMEs are to run successful enterprises and remain competitive. Without innovation it is difficult to comprehend how there can be any light engineering SME development in the country.

Technological advancement, in particular in processes that result in reduction in the cost of production and improvement in product quality, within the light engineering sub-sector of Zimbabwe, has a major positive impact on innovation and increased competitiveness, not only within the sector, but also in other sectors and enterprises which demand products from the sector (CIED, 1996, 1999, 2000; ITDG, 1995). These firms are not, however, 'technology leaders' at the frontier of technological advancement. They are 'technology followers' (Forbes and Wield, 2002). But, as Forbes and Wield point out, there is much that technology followers can do to push themselves closer to that frontier (ibid. p. 63). This includes innovation on the shop-floor as an enduring source of competitiveness (ibid. p. 63.) The same authors comment that the inter-play of process and product innovation is important for the process of firm learning which has potential to lift firms to become better performers in a competitive environment (ibid., pp 98 - 102).

Forbes and Wield refer largely to newly industrialising countries (NICs) in their study of technology followers and innovation, although they do include an example from Zimbabwe (see also Kaplinsky, 1994). Their basic mantra is that firms must innovate in order to add value and indeed this is the whole point of innovation. According to Forbes and Wield, firms can move up the value-chain in two principal ways: (i) by developing their own proprietary technology, and (ii) by making the transition from process innovation to compete through product innovation. They thus describe a learning hierarchy whereby firms need to do the following: (a) learn to produce, (b) learn to produce efficiently, (c) learn to improve production, (d) learn to improve products, and (e) learn to develop new products (ibid., p. 85). The process innovations identified among Zimbabwean light engineering SMEs in the previous paragraph are captured by a) to c) of this hierarchy.

Dore argues that the building of a learning culture, which incorporates 'the information gathering network' is the crucial technical capability for follower firms (referred to in Forbes and Wield, 2002, p. 132). Some firms may generate this learning capacity over time, others may not. The building of a culture for innovation within enterprises involves exploitation and exploration which may be facilitated through networks. Exploitation entails continuous improvement exploration is about creativity. Innovators are good at both exploitation and exploration; non innovators are poor at both. The issue of entrepreneurship, or what may be referred as 'wanting to' is also crucial. Firms need to have a desire to learn and proceed to adopt strategies that fulfil that desire. Firms can only innovate, however, if they have the competencies and capabilities to make use of their learning. The extent to



which a firm will be able to utilise its assets effectively – resources and knowledge – is thus determined by its capability (Platt and Wilson, 1999). Capabilities include skills and functional competencies that allow the firms to take advantage of opportunities.

In general, everywhere in the world, the SME sector is not dynamic. Within the sector, there are some very dynamic enterprises which form a strong basis for future growth and development. However, while there are signs of transformation of the SME sector in the developing world, the innovation abilities of most small scale enterprises in less developed regions are hindered by numerous factors which are part of the process of underdevelopment (Cooke and Morgan, 1990, 1991). Taking into account the importance of innovation, this situation limits technological learning as well as the growth of technological capabilities.

The dynamism of SMEs with respect to innovation and technological learning to some extent depends on and is conditioned by country specific national models or national systems of innovation<sup>4</sup>. Here, the manner in which enterprise support systems are structured, as discussed in chapter four is important. In many developing countries, Zimbabwe included, such support systems are not well established, nor do they function efficiently, as we shall see in Chapter 4. The way in which they are organised or structured has in recent years been subjected to debate in Zimbabwe and this is expected to attract further discussions at national level in the

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<sup>4</sup> The National System of Innovation (NSI) concept helps in the identification of actors and activities, and their interaction at national level in order to specify how learning and innovation are embedded to keep a country on an evolutionary track. NSI refers to the learning and innovation based activities and actors and institutional networks by whose concerted action a national economy builds its technological, business and industrial strength (B.A. Lundvall, 1992).



foreseeable future. It is however, clear that both public and private efforts in supporting small firm innovation are critical in strengthening their innovative behaviour (Cooke and Morgan, 1994). Furthermore, innovation very much depends on knowledge and skills accumulated via learning-by-doing in the industrial establishments or economy, thus again linking innovation to technological learning (Cooper, 1991, in Mongula, 1995).

This link between technological learning and innovation is also referred to by several authors in the context of networking. Ernst and O'Connor (1992) argue that the various interactions that constitute the process of innovation extend well beyond firm boundaries. They add that, in view of the increasing importance of technological development, and core components of the cost, performance and quality of products, strong and sustained interactions between a variety of key actors have substantially increased in importance. Ernst, Mytelka and Ganiatsos (1994, 1998) highlight the importance of 'continuous and numerous interactions among the great variety of economic actors and the feedback across all stages of the production chain'. They argue further that interactions with suppliers and customers, and with the domestic science and technology infrastructure is key to the organisation of innovation as a social learning process.

The major point, therefore, is that successful innovation depends on the close interaction between producers and users of particular technologies, hence the importance of iterative "trial-and error" and cumulative learning by doing, by using and interacting (Lundvall, 1988). Some authors, however, seem to overlook this point. Bell and Pavitt (1993), for example, also refer to the role of linkages and interactions with external actors which point to the

importance of networks to technological learning. These authors, however, place their emphasis on the importance of various kinds of formal institutional structures and 'technology collaboration arrangements'. The role of other kinds of network, formal or non-formal, and in particular as they relate to learning by small and medium scale firms in the South is overlooked by Bell and Pavitt (ibid; Mytelka, 1993). Overall, within the context of Zimbabwe, while there is recognition of the importance of dissemination of knowledge to firms through formal training and enterprise support systems, the various formal and non-formal processes by which this knowledge is generated and used by firms is not well understood.

Between technological learning and innovation, and overlapping with both, is technological capability, on which there is a substantial literature. The notion of technological capabilities according to Ernst, Mytelka and Ganiatsos (1994; 1998) captures "...the great variety of knowledge and skills which firms need so that they can acquire, assimilate, use, adapt, change and create technology". In this definition, there is a reference to productive activities which include new initiatives, that is, innovation. Lall's perspective on technological capabilities, takes a similar emphasis to the previous one as: ..... "the complex of human skills (entrepreneurial, managerial and technical) needed to set up and operate industries efficiently over time...It is equated with the ability to manage the technological function of an enterprise, which includes selecting technologies, absorbing them and developing them via innovations" (Lall, 1992).



Mowery and Rosenberg (1989) echo the theme of this section when they state that the level of technological capabilities within a firm will determine how well it is able to organise innovation as an interactive process. Two different types of interaction involve (a) processes within a given firm, and (b) the relationship between the individual firm and the wider science and technology system within which it operates. The two are dependent on the level of technological capabilities. The type of R & D, for example, undertaken by a firm, its existence or absence also very much depends upon capacity which is determined by levels of technological capabilities.

Furthermore, Ernst, Mytelka and Ganiatsos (1994, 1998) argue that technological capabilities do not fall like manna from heaven, rather their development requires conscious and sustained efforts. There is particular attention to the pre-requisites for developing technological capabilities such as the need for continuous and reliable access to certain complementary assets. These assets include the following: finance; human resources; the quality of materials; intermediate inputs and support services; and level of sophistication of the firm's management approaches, planning procedures and information systems. Considerable attention is made in this literature to the role of enterprise support services in enabling technological development as well as technological learning (see chapter 4).

Technological capabilities are normally complemented by a 'hierarchy of other factors' at the industry, sectoral, regional (or spatial), and national levels. These factors include training, research and communication agencies, physical infrastructure which enhances technological capabilities, and clusters of activities that generate and sustain 'virtuous circles' (i.e.,



mutually reinforcing feedback effects among similar or dissimilar firms) in the development of technological capability. The importance of the long-term commitment needed to build technological capabilities at both firm and national levels has also been considered by Hewitt and Wield, who argue that it cannot be bought from developed countries, but has to be acquired over an extended period (Hewitt and Wield, 1997; see also Mytelka, 1993).

An African Technology Policy Studies Network (ATPS) study on methodology for science and technology policy research was written by Adeboye and Clark (1996) to assist African researchers come to grips with issues of investigative concern. It refers to the limitations of the neo-classical framework in capturing the technological phenomena in all its diversity. The study pays special attention to the concept of technological capabilities and calls for a more pro-active role of the public sector in catalysing the growth of these capabilities. The need for policies to be pro-active has also been explored by Khalil (2001) in the context of weighing Africa's prospects for technological evolution amid the pressures that have been unleashed by market reforms and globalisation. In their review of the various approaches, Ernst, Mytelka and Ganiatsos (1994, 1998) have distilled the following types of technological capabilities; also well acknowledged by Adeboye and Clark (1996):

### **Production capability**

Production capabilities relate to the knowledge and skills used in plant operation, where operational experience and learning by doing play an important role - despite the science-intensity of industrial manufacturing.

Broad types of activity included in this category include production management, production engineering, repair and maintenance.

### **Investment capability**

Investment capability refers to the knowledge and skills utilised in the identification, preparation, design, setting-up and commissioning of new industrial projects or expanding/and or modernizing existing ones.

### **Linkage capability**

“Linkage capabilities” relate to knowledge, skills and organisational competence associated with technology transfer at three different levels, which are: within a firm, from one enterprise to another, and between the firm and the domestic science and technology infrastructure (Ernst, Mytelka and Ganiatsos, 1994; 1998). The second and third of the three levels points to the importance of networks in the process of technological learning.

### **Major change capability**

Major change capability is the knowledge and skills required for creation of new technology which includes major changes in the design and core features of products and production processes. It includes in particular new project ideas, applied and some basic scientific knowledge, and ability to produce patentable ideas.

### **Minor change capability**

This refers to a firm's ability to improve and adapt continuously its products and processes. It refers also to the 'vast area' of adaptive engineering and organisational adjustments involved in incremental upgrading of product design and performance features and of process technology.

### **Strategic marketing capability**

Ability of producers to build up close links with customers and identify in time their needs and changing demands. This requires a precise knowledge of customer needs. Strategic marketing includes the knowledge and skills required for collecting market information, development of new markets, establishment of distribution channels and provision of customer services. Strategic marketing and linkage explicitly refer to relations with outside actors and therefore suggest the importance of networking.

If effective technological learning, through technological capability, is a key element of the innovation process, the resources involved in achieving it are a great deal more diverse and pervasive than what is suggested by the simple models of the innovation process (Bell and Pavitt, 1993). As with all forms of learning, technological learning needs sources. These sources may be formal or informal, may be internal through learning on the job or research and development (R & D), or may be external. More likely they will be a combination of two or more of these. With respect to externally facilitated learning, expertise may be acquired through consultancy or formal training programmes, through books or the internet, and through direct or indirect co-operative associations with other organisations.



For example, formal research is often not the core activity in accumulating the knowledge-base for technical change. This is so because the central feature of technical artefacts is their level of sophistication. This is captured in a large number of performance parameters and constraints which cannot be adequately represented or predicted in a simple theory or model, or fully specified in a series of blueprints or operating procedures. Trial, error and experience play a major role in the improvement of technology. Moreover, the implementation of technical change involves expenditure on a variety of product, process design and engineering, which are important locations for accumulating new knowledge, and important channels for transforming such knowledge into the concrete realities of technical change implemented. As the experience of Japanese firms demonstrates, even pervasive sets of knowledge and skill can be harnessed to drive forward intensive processes of 'continuous improvement' in production which play a major part in the attainment and sustenance of competitiveness in a dynamic world (Hoffman, 1989, Mbohwa, 1998).

Knowledge which is characterised as tacit is an important resource input for technological learning. Tacit knowledge is experiential, uncodifiable and person or institution-embodied. This is so because coping with complex situations cannot be reduced to simply derived and easily applicable 'best practice', but involves 'rules of thumb' that can be acquired and improved upon only through experience (Bell and Pavitt, 1993). The transfer of tacit knowledge, including that which may be needed for efficient operation of 'given' techniques, is therefore neither costless nor quick as it requires the

acquisition of substantial experience. Furthermore, tacit components of the kinds of knowledge and skill needed for changing products and processes are also substantial (Senker, 1992). Both tacit and codified knowledge and skills can be quite specific to particular categories of industrial products and processes. As industrial technologies increase in their complexity, the kinds of specificity of industrial products and processes have become evident. While it may be easier for small technologically dynamic firms to diversify into products and processes with narrow differences, as has been identified with respect to Japanese firms, in general the situation is not the same, as firms intending to diversify require to access different expertises which are usually quite specific (Bell and Pavitt, 1993).

The organisation of learning also often requires individuals within firms who see themselves as technology-keepers (Leonard-Barton, 1995). Technology-keepers in the Zimbabwean case are the entrepreneurs themselves who have the responsibility of tracking useful knowledge inside and outside the firm. This is especially valuable for innovation and is usually what highly innovative firms do. Firms which manage to master technology and initiate a process of incremental innovation, do so as a result of acquisition of knowledge which is neither automatic nor effortless. Even minor innovation requires a spectrum of skills, knowledge and capacities for searching, selecting, assimilating and adapting techniques. The development and maintenance of these capabilities requires both a conscious effort by firms and the investment of significant resources (Bell, Scott-Kemmis and Satvarakwit, 1982). The extent to which firms are able to accumulate technological knowledge over time depends on both internal



factors, which are firm specific as well as external factors. There is a certain kind of internal knowledge feedback as well as external resources or inputs which support the learning process (Albu, 1997). These vary from one case to another.

In a developing country context, learning also involves among other things, building the absorptive capacity to be able to access work done in other firms. This absorptive capacity is primarily a function of prior related knowledge which confers the ability to recognize the value of new information, assimilate it and apply it for commercial ends (Cohen and Levinthal, 1990, p. 128). It is also often referred to as 'knowing how to learn'. Building of learning capacity in small scale firms incorporates the information-gathering networks that can identify what is available in the market and what is worth acquiring for the use of the firm and an assessment of the cost involved (Dore, 1984; quoted in Forbes and Wield, 2002). The capacity to gather this information usually determines the level of the firm's innovativeness.

The primary concern therefore is the firm's capacity to organise innovation as an interactive learning process. Knowledge about customer requirements which can be generated through networking is expected to strengthen the interactions between research and development, production and marketing at the firm level. Close contact with other players in the enterprise support system as discussed in chapter 4 relating to the Zimbabwean situation is certainly of great importance to the innovation process.



From the foregoing discussion, it is clear that technological learning is at the heart of successful innovation, where a key potential source is knowledge that is captured through networks of various forms. As Forbes and Wield argue, an enterprising firm must view itself as part of potentially dynamic network of various actors which include raw material suppliers, capital equipment makers and demanding customers (ibid, 2002, p. 174). Such a firm must consciously strengthen its relations with suppliers and with its customers whose demands tend to increase over time. The discussion that follows is centred upon networks as a source of learning.

## **2.2 The importance of networks and learning to the development of enterprises**

The literature suggests that, while networks offer advantages to the parties involved, they is a certain degree of complexity that needs to be unveiled (Robinson, Hewitt and Harriss, 2000). A number of quotes that illustrate this point have been selected and these are presented at appropriate points in the discussion:

Some ideas on networks are captured as follows (see also Hewitt, 2000 and Robinson, Hewitt and Harriss, 2000, pp 54-55):

"As in a system, one assumes that there is more to the network than the sum of its interacting components.....the network assumes positive or negative synergy....Networks must involve a positive-sum game, where some members may be losers some of the time, but most members are winners, most of the time." (DeBresson and Amesse, 1991, p. 364).

This is a fairly instrumental view of networks. It characterizes them in terms of outcomes. What it does not tell us is how networks arise and what goes on in a network, issues that are partially addressed by Hakansson and Snehota (1994, p.25).

“A relationship often arises between two parties because of the interdependence of outcomes....As it entails mutual commitment over time, a relationship creates interdependence which is both positive and negative for the parties involved. A relationship develops over time as a chain of interaction episodes...It has a history and a future. In this way a relationship creates interdependence as much as it is a way to handle interdependence.”

This view places emphasis on the building of mutually beneficial relationships and a degree of interdependence. The relations are dynamic and they can change over time. The argument on interdependence is also further pursued by Powell who emphasises the pooling of resources and the pursuit of common interests by those participating in a network (Powell, 1990, p.272). This is an insight that informs the understanding of networks and the definition of networks used in this thesis.

Castells (1996, pp 167-8) takes a technologically-driven view of networks, thus providing yet another perspective. The argument here is that information and communications technologies that have come into prominence since the 1980s have released the power of information and knowledge that is so important for firm dynamism.



**\*.....Networks are the fundamental stuff of which new organisations are and will be made. And they are able to form and expand all over the main streets and back alleys of the global economy because of their reliance on the information power provided by the new technological paradigm.\***

**Networks are, in this view, an essential mechanism for realising the potential synergies that arise from sharing information. However, whether all information networks realise such synergies, and the possibility that some may have negative consequences are part of the investigation of this thesis.**

**The players in Zimbabwe's enterprise development sphere can be viewed as one set of networks (see chapter 4, figure 1): this is a way one can analyse complex and unpredictable relationships among a variety of actors that influence SME and technology development in the country.**

**Knoke and Kuklinski (1991, p.173) take the argument further in analysing networks as part of social relations that need to be examined carefully to be understood fully. However, social relations can take many forms where benefits may not spread equitably to the parties involved:**

**'The organization of social relations becomes a central concept in analysing the structural properties of the networks within which individual actors are embedded, and for detecting emergent social phenomena that have no existence at the level of the individual actor'**

**The above quotes indicate that different forms of networks can be used to coordinate social and economic relations between various parties. These networks largely depend on individual and informal relations, based on tacit understanding of common interests and trust. There are however, cases**



where such networks can be managed through contractual relations which are formal and quite specific. While the scholars cited above generally agree about the characteristics of networks and what they entail, as pointed out in the literature, the specific forms in which they are managed can vary greatly. The diverse application of forms of networks, their variations and differences are not adequately captured in this discussion. Yet part of the argument of this thesis will be that investigation of the diverse forms of network in which firms engage is indeed important for assessing their actual and potential input to technological learning.

The analysis of networks above highlights a number of important points as follows:

- (a) Interdependence is important to the understanding of networks;
- (b) The existence of mutual needs and potential benefits to be derived from a network is equally (and relatedly) important;
- (c) A combination of (a) and (b) demands a certain level of cooperation as opposed to (or alongside) competition in the relationship.

Having explored the various expositions debated in the literature about networks, for the purposes of this study, the working definition of 'networking' adopted in this thesis is that it involves sustained relationships or associations which are mutually beneficial to the parties involved and not simply to one individual actor. It entails, a certain degree of cooperation or collaboration which is often non-formal but can sometimes become formal. The relations often involve undocumented arrangements which are reciprocal. The benefits in a network while clear to both parties may, however, not be equal to the parties involved.

The importance of networks to enterprise development is corroborated by a number of other scholars (Schmitz, 1999; Humphrey and Schmitz, 1996; Nadvi, 1995; Harriss, 1999 and 2000; Hewitt and Wield, 1997) as well as by field-based evidence from UNIDO and other donor supported projects in Latin American and other countries. Many of the authors referred to above cite case studies which demonstrate that networking is a key approach in the growth, development and innovation orientation of SMEs in both the developed world as well as in developing countries. It has been argued that the success of industrial firms in the Asian newly industrialising countries, amongst other factors, has been largely their ability to develop local and international linkages and to build on them (Hewitt and Wield, 1997). Other scholars argue that underlying this ability to build linkages are the associated patterns of technological accumulation of firms (Bell and Pavitt, 1993). The analysis places emphasis on two dimensions. The first is the active investment by firms in learning; the second, which is of direct relevance to this thesis, is the active involvement by firms in the wider environment within which they operate and the relationship between this environment and what firms actually do. There is a strong case for inter-firm networks as a key source of industrial and technological strength where small firms can learn from each other or where large firms play an important role in upgrading the capabilities of their small suppliers. Once firms are faced with the need to meet the demands of challenging customers, and at the same time have the networks in place through which they can learn collectively, there is a dynamic process of improvement which is bound to take place (Humphrey



and Schmitz, 1996b). Within the context of such networks, the combination of competition and cooperation drives the search for improvement.

### **2.2.1 An elaboration on the role of networks in technological learning for SMEs**

The potential role that small-scale manufacturing enterprises can play in triggering and sustaining economic growth and equitable development is often not fulfilled because of a particular set of problems characterising SMEs. These constraints have been discussed in the introductory chapter of this study. Individually, SMEs are often unable to capture market opportunities which require large production quantities, homogenous standards, and regular supply (Nadvi, 1995; Altnburg and Meyer-Stamer, 1999). By the same account, they experience difficulties in achieving economies of scale in the purchase of equipment, raw materials, finance, consulting services, and other inputs (Zimconsult, 1999). Small size also constitutes a significant hindrance to the internalisation of functions such as training, market intelligence, logistics and technology innovation. All these inputs are at the very core of firm dynamism (Nadvi, 1995; UNIDO, 1999). Furthermore, small scale can also prevent the achievement of specialised and effective internal division of labour which, according to classical economic theory, fosters cumulative improvements in productive capabilities and innovation (UNIDO, various). Because of the continuous and fierce struggle to preserve their scarce profit margins, SMEs in developing countries are often locked in their routines and unable to innovate their products and processes and look beyond the boundaries of their firms to

capture new market opportunities (Humphrey and Schmitz, 1996; Mytelka, 1997). The perceived pre-occupation of SMEs with short-term survivalist issues against more long term goals and priorities with respect to learning, competitiveness building and enterprise development is the reason why in recent years there is growing debate on mechanisms for facilitating enterprise networking and innovation (Mytelka, 1994, CIED, 1997; Martinussen, 1995; Chaston, 1995).

The significance of networks to the development of enterprises is recognised further by scholars in the literature.

Powell writes:

Networks are especially useful for the exchange of commodities whose value is not easily measured. Such qualitative matters as know-how, technological capability....(etc)... are not easily traded in markets nor communicated through a corporate hierarchy. The open-ended, relational features of networks....., with their relative absence of explicit *quid pro quo* behaviour, greatly enhance the ability to transmit and learn new knowledge and skills (Powell, 1990, p.272).

Networking is one way to marshal resources in the interest of accelerating a process of structural change that significantly and positively impacts upon the building of technological capabilities for domestic firms. Approaches that stimulate firms to lay the groundwork for strategic partnerships with other firms and research institutions in the domestic environment are critical to the building of technological capabilities.

Within the context of a networked structure, entrepreneurial firms are those that consciously seek to develop new relationships with suppliers and clients



and to learn through them. Small and medium sized enterprises in particular, marry specialisation, with networking and partnering, to ensure flexibility that is needed for rapid change in products and processes. This means learning to work together in new ways. By developing the skills needed to form networks and partnerships, firms enhance the longevity of these linkages and the learning benefits that can derive from them (Mytelka, 1997b; Ernst, *et al*, 1994, 1998).

Through horizontal co-operation (i.e. with other SMEs occupying the same position in the value chain), enterprises can collectively achieve scale economies beyond the reach of individual small firms and can obtain bulk-purchase inputs, achieve optimal scale in the use of machinery and pool together their production capacities to satisfy large-scale orders (Pyke, 1992). Through vertical integration with other SMEs as well as with large-scale enterprises along the value chain, enterprises can specialise on their core business and give way to an external division of labour (Marshall, 1920). Inter-firm co-operation also gives rise to a collective learning space, an “invisible college” (Best, 1998), where ideas are exchanged and developed and knowledge shared in a collective attempt to improve product quality and occupy more profitable market segments. Lastly, networking among enterprises, providers of business development services (BDS) and local policy makers can help to shape a shared local development vision and give strength to collective actions to enhance entrepreneurial strategies (UNIDO, 1998, 1999; Nadvi, 1995).

Networking therefore, provides economies of various sorts - R & D partnerships, for example, are one method that smaller Indian software

companies keep up-to date in a rapidly changing field; joint marketing provides cost-savings from networks of smaller firms in the machine tool industry in South East Asian Countries (Mytelka, 1993, Bell and Pavitt, 1993).

More specifically, inter-firm networking is increasingly perceived to be important in economic life, because of its capacity to regulate complex transactional interdependence as well as co-operative interdependence amongst firms (Grandori and Soda, 1995, p.183).

Other authors also note that innovations that emanate from collaborative activities extend the skill base of the firm and the range of knowledge available to it and thereby improve its ability to compete. Because of the production of specialist knowledge, collaboration can be a source of sustained competitive advantage because of the difficulty of imitating it (Gibbons, *et al.*, 1994, p.121).

Co-operation in this case requires a shift from creating knowledge to its configuration, that is, decisions about whom you co-operate with in order to put in place a particular set of knowledge and skills. Configurations such as these are increasing through public-private partnerships and may involve pooling skills from firms, business units, universities, research centres, governments, customers and other stakeholders (Chataway, 2000; Hewitt, 2000). The challenge faced by firms and indeed other actors lies in managing distributed knowledge systems. All this is important for learning networks.

Networks do evolve and develop over time, sometimes passing through



trying times. From casual linkages between for example, firms and their suppliers, firms and their customers, and firms and other 'peer' firms, large or small, which often begin on a low note, deeper forms of cooperation can gradually emerge at a later stage. It is when potential partners in a network have known each other over a considerable period through some non-committal associations, and have gained some degree of confidence and trust in each other that a foundation for cooperation is laid. It is through these relationships and processes, often including a test phase, that good networks which are able to sustain themselves eventually emerge. In this context, trust becomes a key concept associated with networks to which I now turn.

### **2.2.2 The importance of trust to networks**

Networks depend to a large extent upon the existence of trust (Harriss, 1999 and 2000). Based on the discussion above, the understanding is that networks can be regarded as relationships which involve the 'mutual orientation' of firms and or organisations toward each other. Such relationships develop through exchanges which involve "a process in which the parties gradually build up a mutual trust in each other" over time (Johanson and Mattson, 1987, p. 258).

In their interpretation of contemporary trends in business management, some scholars argue that:

'Although co-operation has long been recognized as crucial to the success of enterprises, there is evidence that its role will become even more important in the future. In particular, the success of

emerging structural forms, such as the self-managed task team, the horizontal organisation, the network organisation, the virtual corporation, and the international joint venture, rest largely on effective cooperation.....' (Smith, Carroll and Ashford, 1995, pp. 9, 11; see also Castells, 1996, chapter 3).

The same authors argue that although research has identified a number of different conditions for the establishment of co-operation, 'virtually all scholars have agreed that one especially immediate antecedent is trust' (Smith, *et al.*, 1995, p. 10). Relationships are 'much more voluntary and self-defined' and are dependent upon the existence of trust as the key control mechanism (Castells, 1996, p. 164).

Trust plays an important role in forging successful inter-firm networks as well as building relationships between enterprises and within enterprises (Hewitt, Wangwe and Wield, 2002). Literature on networks suggests a degree of interlocking which can only function when relations between firms are sustained by more than minimal trust (Humphrey and Schmitz, 1996).

Zucker, a sociologist, who researched – as he puts it – '*the production of trust*' in the United States between 1840 and 1920 suggests ways in which trust is produced as follows (Zucker, 1986, p.54):

- a. *Process based trust* - where trust is tied to past or expected exchange such as reputation or gift exchange. This is sometimes referred to as *earned trust*.
- b. *Characteristic-based trust* - where trust is tied to a person, depending on characteristics, for example, family background or ethnicity. This is often also described as *ascribed trust*. A particular instance of ascribed trust,



which will be relevant when the research results are discussed (Chapter 6), is that of *kinship-based trust*. Here, because of the kinship bonds that describe such a network, the basis of trust is very high and requires comparatively little effort to generate and sustain it. However, its limitation is that it is tightly boundaried within the knowledge bounds of a particular social, economic and cultural context. Exposure to new ideas and knowledge is therefore more constrained than with the other networks described here.

- c. *Institutional-based* - where trust is tied to formal societal structures, depending on individual or firm specific attributes. This may apply to individuals or institutions and can provide a basis for both contractual and competence trust.
- d. *Generalised trust* - where trust occurs in situations where it is a characteristic of the system of exchange as a whole and its context; trust accorded to a wide range of agents.
- e. *Selective trust* - accorded to particular individuals, groups or institutions - based on characteristics of exchange partners. One might also refer to this type as 'targeted trust' because identification or selection of partners by a potential party to a network is based on prior knowledge of would-be partners and their expected behaviour within the broader societal context. Note that this is an example of how some of these categories of trust might overlap. The basis of selective trust for example may include elements of characteristic-based (ascribed) trust.

f. *Extended trust* - most often developed through experience of working together over time, initially cooperation on small activities with limited risk, later moving to more challenging issues. Over time, partners are gradually trusted with bigger and more complex tasks requiring considerable commitment. Extended trust involves more substantial cooperation and commitment than for example, in the case of process-based trust. Humphrey and Schmitz (1996) argue that....."competitiveness in manufacturing enterprises increasingly requires extended trust...". This kind of trust contributes towards sustained collaboration and cooperation which enhances the performance of firms through among other things the acquisition of knowledge.

The types of trust that are needed in inter-firm or inter-institutional cooperation activities are varied and may include one to all of the above. Moreover they require the commitment of prime movers, that is, the institutional and individual players involved in developing and strengthening the base for cooperation (UNIDO, various; Hewitt, 1999; Harriss, 1999 and 2000; Hewitt and Wield, 1997). Within the Zimbabwean enterprise development context, deeper forms of networks which are based on trust thus have a history which needs to be understood and adequately contextualized (Zimconsult , 1999).



### 2.2.3 SMEs and networking: Kinds of network that might facilitate learning

There are networks in which firms in collaboration with their partners have clearly identified learning targets or what one might call *knowledge gaps* within a particular enterprise, (e.g., human skills, technological or production management gaps and new information). Some knowledge within each firm of the current position of the partner firms regarding their technological capabilities and levels of competitiveness, for example, in terms of quality, productivity, product range, and other areas is essential. So too is knowledge of what needs to be done to improve certain firm-level capabilities, that is, to improve existing knowledge/skills, and so on (Cooke and Morgan, 1990). In situations where firms are pro-active about learning, having a *determination to learn* and taking actions to acquire knowledge through various methods, networks can be expected to facilitate learning to a considerable extent. The opposite is also true as in some cases learning may not even be on the agenda. Other issues may actually be more important, for example, the immediate survival of the firm and how to cope with other immediate priority concerns which may well exclude learning.

Small firms which are determined to learn will identify key sources of learning and have some reasonable knowledge about the capabilities of potential network partners. Small firms are able to position themselves to learn better when they know well what can be derived from specific networks. Similarly, the firms can also plan or position themselves better for the networking challenges with a view to facilitating learning once they know key characteristics of potential network partners. Some network partners

may be progressive, others may not be. Passive partners who lack credibility may not be very helpful to networks (Humphrey and Schmitz, 1995; CIED, 1999).

However, commitment, willingness and ability of partners to work together are crucial. In some cases, one party may actually be more keen to learn than the other party. It may well be that within a network, one party benefits through learning while another party derives other benefits which have nothing to do with learning. Such a network can still be quite valuable to both parties (Mytelka, 1997b; Nadvi, 1995).

Whilst the focus in this discussion is learning, it is noteworthy to state that networking can involve a variety of issues which are of importance to firms. It is acknowledged that not all such issues may contribute anything significant to learning within enterprises. Networks which might better facilitate learning are those that are based on *selective trust* where firms have prior knowledge of partners, their proven track record on similar activities with other firms or what exchange partners are known to be capable of achieving. Cases where relations are cultivated over time and developed based on previous experience of collaborating on similar or other areas referred to above as *selective trust* are particularly noteworthy. In such situations relations may start quite small based on casual contacts but later become more sustained and deeper with time as partners establish trust and confidence in each other. The basis for this deeper co-operation is what is referred to as *extended trust*, referred to above. *Selective trust* and *extended trust* may be considered to be the foundation of good networking for learning because



they entail a deeper level of cooperation than other kinds of trust (Humphrey and Schmitz, 1996).

#### **2.2.4 Lessons from the more developed regions**

In the industrialised world, a new industrial order has emerged from 'best practice' firms, which are commonly manufacturing SMEs in countries like Japan, Germany and Italy. The common features include an emphasis on manufactured goods (high value-added products), a skilled workforce, flexible inter-firm transactions and widespread use of networking or learning by-interaction (Cooke and Morgan 1990). The interaction referred to in this instance is between producers and users, and between producers and the technology support systems (of various sorts, including technology development organisations and other firms). Italy, with its long tradition of small firms operating collaboratively and competitively in industrial districts employs strategies that sustain the advantages of small size in globally competitive markets. Evidence shows that small firms which are well networked in the Italian industrial districts outperform all firms in the same industrial sector (Cooke and Morgan, 1994). Cooke and Morgan further argue that countries with strong innovation systems and networks in which SMEs are the major players are the most competitive for the future.

Denmark also provides a good example of an economy of connected industries in which international competitiveness has been achieved. The strength of the networks in Denmark is derived from the ability that SMEs have shown to learn from each other and an intermediary system which acts as a successful catalyst for co-operation (Huggins, 1995).

Internationally, in several medium-income countries of South East Asia and Latin America, the relationship between networks and the ability of small and medium sized firms to learn, change and adapt is assuming greater importance currently than ever before. This is the case in selected Latin American and South East Asian countries where networks have actually become more pronounced in their development over the past one and half decades (Mytelka, 1997b).

However, while the development pattern that is described above, seems to be clear in terms of its importance to productive enterprises in manufacturing firms in high and medium income countries, a very different picture emerges in a developing country context like that of Zimbabwe. It is partly because of this situation that this thesis is important.

#### **2.2.5 Networks as a source of learning and development in Zimbabwe**

In Africa and in Zimbabwe in particular, networks of small and medium sized light engineering firms are emerging but are still quite weak (CIED, 1996, Zimconsult, 1999). At a general level, networks of small-scale firms have been somewhat slow in emerging in Zimbabwe for a number of reasons. Before the Economic Reform Programme was initiated early in 1991, a closed economy with very tight controls in the allocation of key resources, especially foreign currency allocation by government, very restrictive space allocation for the SMEs by local authorities and the state, and generally anti-SME regulations all militated against the emergence of networks of SMEs. Low or lack of linkages in the private sector also hindered the growth of SME development and prevented the SMEs from being adequately empowered to



compete for large-scale sub-contract work. Up to the end of the 1980s, there was virtually no structured system of SME services ranging from financial support, business advisory to technological support systems (UNDP, 1997; JFA-PRESA, 2000). The SMEs that existed, especially within the light engineering sub-sector were mainly White owned. The vast majority of Black owned enterprises were mainly in the micro-scale informal sector. This situation has persisted to date although some significant changes have since taken place as an increasing number of Blacks now own light engineering enterprises in the SME sub-sector. This explains why in chapter 5, the large majority of SMEs were established during the post economic reform period.

With the adoption of the Economic Reform Programme, a number of measures were put into place to encourage SME participation in the economy in general and to create and develop SME networks. This saw the emergence of a host of 'support institutions' in different sectors, for example, finance, technology support and business advisory services (see chapter 4). These formed the main types of networks and benefits to the SME sector. With time more initiatives in networks and linkages were embarked on and one such example is the CZI Linkages Programme in Manicaland. This programme, initially funded by a Norwegian development agency, NORAD and started first in Manicaland province has successfully spread to the Midlands province. Though it has been successful in encouraging mainly vertical integration between SMEs and large-scale companies, the Manicaland project has the potential to develop and facilitate horizontal integration between SMEs and selected large scale enterprises. However,

in Zimbabwe, despite the logical and seemingly apparent economic arguments in their favour, linkages have not developed to the same levels as in other countries (Zimconsult, 1999).

From Zimbabwe's historical experience, the networks of SMEs that have emerged are rather weak, such that without an external stimulus, they are not likely to develop at a faster pace (CIED, 1996, Zimconsult, 1999). Besides the general lack of recognition of networking as an important strategy for promoting the development of SMEs, it is evident from recent field investigations that Zimbabwean SMEs are not strongly engaged in the kind of cooperation activities which the networking approach entails (Zimconsult, 1999). Although Zimbabwe does not seem to have a shortage of enterprise support agencies, which purport to promote the welfare of small enterprises from the supply side, on the demand side there is little evidence of strong networking between firms in pursuance of common goals and objectives. Evidence of such networking would be found in firms coming together in a more systematic way to deal with a common set of constraints like access to markets, finance, raw material supplies, acquisition of skills through training programmes and dissemination of information. Partly because SMEs in Zimbabwe have in the past been closed out of the mainstream economy, due to an unsupportive policy regime, and have a poor history of engaging in serious collaborative activities, the development of networks has been hindered. Different firms have regarded themselves as competing individual players with little or nothing to do with each other and in the process have failed to exploit potential areas in which they could



benefit from networking for the attainment of their individual goals (IDRC, 1996a).

### **2.3 Analysis of research gaps**

While extensive in scope, this chapter has indicated some gaps in the literature on networking and enterprise development. These gaps suggest lines of enquiry when investigating the thesis hypothesis that networking categorised in various forms of associations is important for technological learning within firms. Small and medium scale light engineering firms that are strongly networked exhibit a greater level of technological learning than poorly networked firms. Thus there is a positive relationship between technological learning and networking.

The gaps concern the paucity of evidence-based studies in this area with respect to Sub-Saharan Africa, and relatedly the blanket use of the term 'networks' as if they might unproblematically be a 'magic bullet' for SME development. Thus the technological learning literature with respect to SMEs in developing countries, and especially in Sub-Saharan Africa is mainly about in-house learning. There is actually little about networks and linkages in these countries as a source of technological learning. Moreover, some kinds of network may be useful or valuable for technological learning; other kinds may not be so valuable. This is an issue that needs to be checked out by research. The underlying reasons why networks have worked in certain countries while they may have failed to fully develop in other countries, especially in the context of developing countries is something that researchers need to explore further.

In the case of Zimbabwe's industrial development, although networking as an approach is not yet well established and understood, indications are that it is growing in importance, at least in rhetoric, against a background of rapid change and an unstable macro-economic and business environment (Small Enterprises Advisory Group, 1997; Zimconsult, 1999). However, what is said in the public domain about networking in the available literature and what is actually done about it does seem to differ considerably as the understanding of what constitutes networks is quite variable. It seems also that within the country's development context, what are referred to as networks are somewhat basic linkages or associations which are not the deeper forms of co-operation which the network approach entails. In fact the term 'networking' is a highly misused one in Zimbabwe and also in other regions to the extent that it may actually lead one to conclude that it is a hollow term to which one can attribute any meaning that suits any particular purpose as pointed out by Hewitt in an analysis of inter-organizational relationships (Hewitt, 2000).

Overall, the processes involved in technological learning and the development of endogenous technological capabilities for manufacturing SMEs are even less understood within the Zimbabwean context, and indeed in many developing countries. This study with its focus on the relationship between networking and technological learning as elaborated upon in the section on research hypotheses in chapter 1 is expected to shed some light on the technological development process as this relates to SMEs in Zimbabwe.



## **2.4 Concluding remarks**

An analysis of the literature suggests that technological learning is a long-term and on-going process which requires firms to interact with a wide variety of actors within the enterprise support system. The interaction can either be pro-active or passive, depending on the capacity firms have to engage the actors. It is actually the firms themselves which are the major sources of the technological learning process because learning does not effectively occur in an environment where firms are passive or are insensitive to the broader context in which they operate.

The role of learning in the innovation process has received considerable attention in this chapter. Through technological capability, technological learning is what enables innovation. In turn the innovation requirements for firms to survive and develop drives the need for technological learning.

Although networks are acknowledged in the available literature as important to development generally, their role as a source of technological learning in a developing country context is insufficiently understood. As spelt out in chapter 1, the main focus of this research is upon networks that are useful to technological learning and not on networking as a general development strategy. Because of the failure by the existing literature to fully address issues specifically to do with the relationship between networking and technological learning in low income African countries such as Zimbabwe, this thesis becomes important. This is especially the case with respect to SMEs which constitute the light engineering enterprises which form the basis of this study.

Finally more recent literature covering development practices in the industrialised world offers some important lessons and insights regarding the understanding of SMEs and the potential role of networks. How these lessons and experiences can be applied within the context of a developing country like Zimbabwe might need to be investigated further by research which gives a better understanding of local reality blending it with global development trends and or lessons. Such a task would require separate research and is only touched upon in this thesis.



## **CHAPTER 3 : RESEARCH METHODOLOGY**

### **3.0 Introduction**

This chapter explains the methodology adopted in the research. It begins by explaining my prior knowledge and experience that enabled me to start with some authority on the subject. From here, the approaches used to generate research information are examined. The chapter presents a summary of the research questions, analyses how the information was collected and also explains the rationale for combining a quantitative survey with case studies. The strengths and weaknesses of structured surveys and case studies are also discussed in this chapter with specific reference made to the study. Reference is also made to the credibility of the research findings against the background of constraints faced in this research.

A quantitative survey which was conducted during the early phases of the research was complemented by case study analysis. An important phase of the research involved analysis and interpretation of both structured survey data as well as information generated from the case study investigations. The final phase involved the writing up of the research results. One stage in this final phase of the research before finalizing the research results involved the consolidation of case study material and analysis, re-examination of the literature used and how it related to the study, collection of additional information, in particular qualitative information from case study firms where gaps were perceived to exist. However, the research phases as defined were not very clear-cut. This was especially the case because during the final stages of this study, for example, the researcher continued to fill in

some identified gaps with a view to strengthening all the sections of the presentation. Where necessary, additional data were also gathered and integrated into the research analysis. The analysis was reviewed as an on-going process throughout the packaging and writing up of the research results.

### **3.1 Personal background of the researcher**

I have been involved in development research since 1984 when I joined the socio-economic research unit of the then department of Agricultural Technical and Extension Services (AGRITEX) of the Ministry of Agriculture, Government of Zimbabwe. By 1989 I had risen to become the Principal Agricultural Extension Research Specialist of the same organisation. I later joined the Intermediate Technology Development Group (ITDG) where I worked in various projects supported by the organisation and its partners for 10 years. I worked on various enterprise support projects, carrying out policy research studies, monitoring and evaluation research, mid-term reviews and impact assessment studies. I have continued to be active in research on enterprise and technology development. I have also been an active member of an international network of technology policy researchers in Africa for the past 12 years. The analysis of enterprise support systems presented in chapter 4 is largely based on the experience I gained over many years.



## **3.2 The sample of firms**

### **3.2.1 Choice of study area**

Harare was chosen as the principal area for the study. This was for several reasons. Manufacturing activities in the country are concentrated in Harare, the capital city; and Bulawayo, the country's second largest city. The two cities account for about 75% of the volume of industrial output. Harare is the leading industrial centre in Zimbabwe and has a population of approximately 2 million inhabitants. It has the largest concentration of both formal and informal SMEs. Its contributions to total manufacturing output in the country is 58%. Bulawayo accounts for about 17% of the manufacturing outputs. The rest of the country accounts for 25% (CSO, 1995/96; 1997/98 Reports). Similarly, Harare accounts for 50% of all formal manufacturing sector employment (UNIDO, 1999). Harare also has the largest number of formal sector SMEs and more light engineering enterprises than any other centre in the country. As there were also logistical constraints of spreading the study across several centres with limited resources, firms within and around Harare were selected for the study.

### **3.2.2 Selection of the firms**

The research sought to establish strong links with various stakeholders from the outset. The research is well linked with important existing practical SME development initiatives. For example, I looked at all the available registers of light engineering SMEs in Harare which in most cases also covered other sectors. Firms that were not involved in light engineering activities were screened out leaving a manageable population of firms compiled from

secondary sources. A number of SME development programmes assisted considerably in identifying firms to be studied by providing valuable background information of companies listed on registers. The information supplied through the programmes was useful in selecting firms which were covered by the quantitative surveys. Furthermore, the information also assisted indirectly in the identification of case study firms following the analysis of quantitative data as well as available secondary information.

Information sourced from people located within a small number of local institutions involved in SME development was also used in compiling the list of firms engaged in the light engineering sector. Some of the agencies had compiled an inventory of firms involved in various sectors, including the small scale light engineering sector. Constraints were encountered in that some of the available lists of firms obtained from the secondary sources comprised large firms which were not of direct relevance to this research. Where information on SMEs existed, it was not specific to the sector under investigation. Instead it contained information about other sectors with relatively few light engineering firms in the lists. In the end, no single source had a comprehensive list of potential study firms. This necessitated compiling a fresh list of firms for the purpose of the research from the variety of sources.

There is a problem of possible bias when basing a sample on lists of firms provided by enterprise support organizations. The research needed to be representative of all light engineering firms, not just those supported by these agencies. What emerged, however, was that most of the firms that were listed by enterprise support organizations were not in any meaningful



way linked to these agencies. In the majority of cases, only very basic contacts had previously been made during some basic data collection exercises carried out through those organizations. The information available included name of the firm, address, products produced, and sometimes also its size by number of employees within the firm at the time when the basic information was collected. The existence of the information, in cases where it was available, did not constitute any significant relationships between the providers of the information and the receivers. Firms were also grouped in accordance with their technical area of specialization and products produced. Over and above this, the survey sought to be as representative as possible in the coverage of the light engineering firms in the selected areas with a view to meeting at the least, the minimum conditions that allow for acceptable levels of scientific and statistical generalizations. In this regard, a certain minimum target number of enterprises was reached, while at the same time attempting to cover a broad range of firms involved in light engineering work. More discussion of this issue is in the following subsection.

### **3.2.3 Sampling procedure**

The sampling procedure involved the listing of names of all light engineering firms identified from the various sources. The number of light engineering SMEs originally targeted was 75, out of an estimated total population of light engineering SMEs of about 250 operating in Harare and surrounding areas (SIRDC, 1999)<sup>5</sup>. About 30 percent of the estimated population of light

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<sup>5</sup> This is also based on my own estimate of the firms drawn from various sources.

engineering firms in the study area was thus targeted for the study. The sample size was, however, later reduced to 42 because of field level realities which made it impossible to cover a large number of enterprises in this study. The main issues and problem areas that led to the final sample for the study are as follows:

- Failure to compile a more comprehensive list of SME light engineering firms: it was not possible to have a full listing of the estimated 250 firms from existing secondary sources because no such information had ever been compiled before; hence the dependence upon somewhat incomplete multiple sources from many actors. Any attempts to conduct a primary data collection exercise to generate such information would have been too expensive for the research and time consuming.
- The study deliberately avoided covering large numbers of micro-entrepreneurs because the research focus is on SMEs. Any attempts to increase the sample size by incorporating large numbers of micro-scale entrepreneurs would have biased the study in favour of that category of enterprises. This would have had the effect of shifting the research from its original SME focus comprising largely formally registered firms to the non-formal sector.
- Some key potential respondents were either unavailable or showed no interest in a research process which seemed quite involving and yet was not able to offer any immediate tangible benefits to participating firms.



In the end, for the revised sample of 42 enterprises, the response rate to the structured questionnaire was approximately 90%, making the actual sample 38 firms. This was more than the 30 required for theoretical and empirical statistical validity. It is also noted that although the definition of SMEs in the preceding chapter included firms with employment levels ranging between 5 – 100, the SMEs covered in this study mostly had employees ranging between 6 – 20 and the firms themselves were mostly of similar age, being fairly new. However, the few older and larger firms in the sample were retained in case they provided useful points for comparison. Some of the basic characteristics of the 38 firms are summarised in table 5.0 in chapter 5.

### **3.3 Combining quantitative and qualitative research**

The research depended on a range of methods for generating information: existing external secondary data sources, existing records and other documents compiled by firms, surveys which sought to gather both quantitative as well as qualitative information, group discussions, case studies, and participant observations. There was flexibility in the extent to which each of these methods was applied from one firm to another. This was mainly because in the first instance it was not the intention of this study to apply all the methods on all the firms as it is practically impossible to achieve such a target. Not only would the financial resources not allow such an ambitious target, but also firms in this part of the world generally cooperated to different levels or extents and sometimes researchers can become too intrusive and offensive to some firms when certain research techniques are

applied.

The research approach adopted in this study combines quantitative and qualitative techniques to data collection and analysis. The quantitative method was executed through a survey of all the 38 firms in my final sample, supplemented by other techniques to check the reliability of the data provided. The qualitative method centred on four in-depth case studies, and combined the survey data with several of the other sources identified above. The merit of combining both qualitative and quantitative methods lies in that no data collection methodology is sufficient on its own in terms of adequately exploring development dynamics (Chipika, 1996). Every method has its own strengths and weaknesses and researchers ideally exploit the advantages of two or more methods in one study to offset the weaknesses of using one method only.

A brief analysis of the selected approaches is useful. Regarding the quantitative survey, this is one of the oldest known of research methodologies used for assessing development dynamics, including that of enterprises. The quantitative technique has a number of strengths as well as weaknesses (Strauss and Corbin, 1990; De Vaus, 1996). With respect to strengths, the approach is claimed to have a high degree of objectivity and is therefore more convincing and informative for policy making than other methods. The approach gives individuals a chance to answer independently concerning what they are experiencing and it is the researcher's task to draw on the general trends from what is being investigated. There is also a belief that, through rigorous sampling and a large enough sample, quantitative methods are representative of the population in the group, in this case the



light engineering firms in the sub-sector upon which the research was conducted. There is also a perception that quantitative techniques can correctly identify problems, providing an insight into complex dynamics which can be done with little suspicion and tension from the people providing the data.

There are, however, many criticisms leveled against surveys, some of which are genuine, although others are based on insufficient understanding of them, such as a failure to recognize that they can be combined with other research approaches to produce high quality and credible research results. Moreover, quantitative techniques need not be applied on all types of research because other methods may be superior depending on the issues to be investigated. Some of the main criticisms include the following (De Vaus, 1996):

- a. a perception that surveys are too restricted because they rely on highly structured questionnaires which are necessarily limited.
- b. surveys cannot adequately establish causal connections between variables.
- c. Surveys just look at particular aspects of people's beliefs and actions without looking at the context in which they occur. Taken out of context it is easy to misunderstand the meaning of behaviour.

Qualitative methods are thought to overcome these disadvantages because of their higher level of flexibility and capacity to enable researchers to cover issues in greater depth than surveys. The case study is one qualitative approach to doing social science research. Every research strategy, however, has peculiar advantages and disadvantages, depending upon

three conditions: (a) the type of research question, (b) the control an investigator has over actual behavioural events and (c) the focus on contemporary as opposed to historical phenomena (Yin, 1994).

The case study is an established approach to qualitative research. Whereas quantitative surveys are good at answering 'what' questions, on the whole, case studies are the preferred strategy when "how" or "why" questions are being posed, when the investigator has little control over events, and when the focus is on contemporary phenomena within some real-life situation (Yin, 1994). However, investigators are encouraged to exercise great care in designing and executing case studies to overcome the traditional criticisms of the approach. One major traditional criticism against the case study approach relates to concern over lack of rigour. Quite often case study investigators become 'sloppy' and allow equivocal evidence or biased views to influence the direction of findings and conclusions (Yin, 1994). Investigators, therefore, have to work hard to report all evidence fairly without bias. Another concern relating to case studies is that they provide little basis for scientific generalization. However, case studies like experiments in the natural sciences do not represent a sample; the investigator's goal is to test, expand and generalize theories or what can be termed analytic generalization and not statistical generalization. In this respect the case study approach can be very valuable in its own right or in complementing other research approaches as in this case.

From the quantitative survey of the firms, basic baseline information about the firms was obtained along with useful, but more problematic (see below), data about each firm's technological learning characteristics and networks. It



was however, not possible to understand from the survey alone how and why firms were in the situation that they found themselves or why certain firms seemed to be better able to network than others and also why for instance some firms seemed to have higher technological learning characteristics than others. The case studies which were carried out were critical in dealing with the important qualitative issues which the structured survey was not able to tackle adequately and investigate in depth. The “how” questions referred to above relate to ways and means which concern certain observed behaviour. For example, the research was interested to establish the different ways of networking and mechanisms used by firms to learn technologically as part of the analysis of firms which feeds into the overall research results. The “why” questions relate to the reasons or purposes of certain actions or behaviour observed in the research. When these questions are asked rigorously in any research, they help to unveil the existence of causal relationships between variables. This is also assisted by a good understanding of the established or known behaviour of the phenomena under study, in this case, that of small scale light engineering firms.

### **3.4 The quantitative survey**

The survey sought to investigate whether there is a statistical association between networking and technological learning that would support the research hypothesis. The survey also generated data which was used to establish whether other associations may exist which might suggest rival hypotheses (refer to questionnaire instrument, Appendix C).

Respondents comprised mainly the firm owner. Other people who included senior managers and key personnel within the enterprises were also surveyed for purposes of triangulation. The study established fundamentally that ways of measuring technological learning and networking were needed before the research instruments, in this case the questionnaire and the compilation of the data needs, were finalized. A projection of the type of data required and the research questions to be addressed needed to be done before the commencement of the quantitative survey. This approach was essential to ensure that the research instrument used was sufficiently focused to allow the generation of the kind of data that is relevant and sufficient to address key issues for the study.

Ways of measuring technological learning and networking based on the kind of information which was feasible to collect in a structured survey from study firms had to be devised. There were difficulties in finding suitable proxy indicators for both technological learning and networking as both have multiple dimensions (see chapter 2). The research had to develop composite indices for the two sets of variables based on proxy indicators. Difficulties arose in obtaining independent and objective data to develop these indices, with some of the dimensions hard to quantify. The decision was therefore made to choose self-perception by survey respondents in relation to the different dimensions of technological learning and networking by the sample of firms in the survey schedule where it was impossible to collect 'hard' data.

Certain key information from the firms was therefore generated through self-assessment mainly because it was not possible to adopt more objective



criteria since there were insufficient records relating to the key issues investigated in this research. Most small firms rarely keep comprehensive records about their activities. If for example, it had been possible to source much of the information required in this study through readily available reliable secondary information which included the firms' own records and other documents, this would have been preferred. The need to source primary data would have been reduced and as such, the structured survey instrument would have focused upon fewer issues and questions than was the case in this study. In such a situation, more time could have been allocated to the case study approach, which would also have involved thoroughly reviewing existing information, cross-referencing the information and carrying out validity, reliability and consistency checks as much as possible.

The merit of using self-perception criteria is that because firms know their situation best, and if the questions are asked carefully they are in a position to present an accurate picture relating to research issues and questions under investigation. The problem is that respondents may intentionally or unintentionally give biased answers. Caution was exercised by explaining fully to representatives of firms the importance of giving truthful data in order for the research to have practical relevance. On-site visits to the premises and checks on the operational basis of the firms were very useful in that through observations, reality checks and probing of respondents and the use of other research techniques of cross-referencing data by the researcher, respondents were left with little or no choice but to be as objective as

possible in their responses<sup>6</sup>. Used in combination with other more objective methods, the approach adopted was able to generate very useful information for assessment.

The approach did not remove problems of possible bias in the data generated but certainly helped to reduce it to a minimum. In this study, because other qualitative approaches were applied, situations where inaccurate information or data had been provided could be detected fairly easily. The problems discussed above actually strengthen the need to use other approaches adopted in this study such as the use of case studies that are presented in chapter 6.

#### **3.4.1 Problems with existing secondary data**

There are several ways of gathering information for a study of this type. The first step is to identify existing data sources and information gaps. In this case firms are the principal data sources since it is very uncommon in the country's enterprise development context to find a great deal of information about specific firms elsewhere outside of the firms themselves.

In those cases where secondary information is readily available to researchers, it constitutes a substantial proportion of the total information collected. The same cannot be said, however, in cases where it is not possible to access such information. In Zimbabwe for example, most surveys of firms have not only been biased in favour of large scale firms, they have also ended up with highly aggregated results where it is practically

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<sup>6</sup> 'Reality checks' and 'probing' in this case refer to a situation whereby if the researcher gets an impression that the data being provided does not match with what is observed, or that he/she is being lied to, or given inaccurate data, further questions may be asked until



impossible to identify from which particular firms the information was generated. This applies even to sector level studies periodically undertaken by the Central Statistical Office, a government department from which it is practically impossible to obtain any disaggregated information pertaining to any specific firms.

The sourcing of secondary information as it pertains to the needs of this research is problematic, therefore, in that SMEs in Zimbabwe, including the light engineering firms studied do not under normal circumstances keep sufficient records about their activities which can be monitored over time. Historically inadequacies in the keeping of records within firms is an area associated with the generally low levels of business management and development in small scale enterprises, an issue which has been of concern to many business development practitioners in the country. Where records are kept, they are often very basic and incomplete. Moreover, they do not extend to key activities and operations that are of strategic importance to firms, and worse still they do not cover in a substantial key issues for the research. This explains why for example, this research has had to depend a great deal on primary sources of information generated largely through structured surveys and case studies. In such cases the option for the researcher is to generate as much fresh information as possible within a limited time and usually with limited resources.

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more satisfactory responses are given. The tacit knowledge of the researcher plays an important role.

### 3.4.2 The survey: data requirements for analysing technological learning and networks

Apart from some baseline data the aim of the survey was to capture through quantitative data (see Appendix C questionnaire instrument) the technological learning and networking characteristics of each firm. This presented a considerable challenge with respect to operationalising both these key concepts of the research hypothesis.

With respect to technological learning, the data for this research, although gathered over several months, inevitably represent snapshots of firms studied. Technological learning, however, is an invisible (to the outsider) process over time and is impossible to capture directly via such snapshots. What is possible to capture are the outcomes of technological learning. We usually refer to these outcomes as *technological capabilities* and they can be observed at a particular point in time via their multiple dimensions, which the literature (see chapter 2) usually identifies as a firm's production process and product capabilities, and research and development.

In examining these multiple dimensions of technological capability, the research was careful to distinguish between 'inputs' that indicate capacities (i.e. potential for technological learning) and 'outputs' that indicate technological capabilities as manifestations of technological learning.

The following can be classified as inputs to technological capabilities:

- Background of entrepreneurs and key personnel (related industrial experience);
- Personnel composition (number of skilled, semi-skilled, unskilled);



- Employee training in place (whether there is any planned scheme in place); and
- Quality of in-house training (based on precise training mounted).

The following data have been used for measuring technological capabilities as outputs of technological learning:

- Production process adaptations over a specified period of time;
- Level of involvement in R & D (whether high, medium or low);
- New products introduced over time, including adaptations of existing products over a specified period of time;
- Quality management systems (self-assessment rating plus documentation);
- Product quality for all key products manufactured by each firm (self assessment rating); and
- Level of productivity (based on self-assessment rating).

Thus in this sense the technological capability 'outputs' have been used as proxy indicators of technological learning. Subsequent discussions of the results refer throughout to technological learning, but it should be borne in mind when reading these that what was directly measured were the dimensions of technological capabilities, largely through the self-perception of the interviewees (see above). It should also be noted that one indicator in the survey – that of staff commitment to quality – was not included in the technological learning composite although it was run as a separate dependent variable in statistical tests and analysis (see chapter 5). This was because, with respect to the technological learning composite, product quality and quality management system variables are expected to capture

adequately quality issues. Also to note is the point that inputs that indicate technological capabilities (e.g., employee training and quality of in-house training) were not included in the TL composite, but were used in the disaggregated statistical tests.

Turning to networks, the following types of networks/linkages were investigated:

- Customer;
- Supplier;
- Firm-to-firm (meaning firms in a similar line of business); and
- Enterprise support organization.

They were chosen because a) all firms have to have linkages with customers and suppliers; b) linkages with other firms are known to be important for fostering technological learning in appropriate circumstances (see chapter 2); c) there is a proliferation of agencies in Zimbabwe whose function is to support enterprises (see chapter 4).

Questions were asked of these networks directly and indirectly regarding:

- Which actors, individuals or institutions they are linked to, and the type of institution;
- Specific aspects or areas of collaboration (where this is stated);
- Level of association, depth or quality or strength of association (from the perspective of firms);
- Description of relationship; nature and characteristic of relationship with ESOs, suppliers of inputs, customers, other firms (large or small); is relationship good, cordial or poor;
- Major constraints faced with particular linkages or networks;



- What specific benefits are derived from the linkages (focusing on the enterprise and exchange partners); and
- How would they rate the quality of each of the different linkages they have?

Again, for most of these networking dimensions, reliance was on self-perception. Also, when asking questions of this nature, it is quantitatively very difficult to tease out networks from normal business linkages as respondents are likely to conflate the two. Thus, the more general term 'linkages' had to be accepted as a proxy for networks in the survey. This is another reason for interrogating more the nature and characteristics of the relations through the use of qualitative research methods. The approach can determine whether the relations described are more than ordinary business linkages.

### **3.4.3 Survey construction and administration**

A structured questionnaire was designed as an instrument for interviewing senior managers and owners of firms (see appendix C). The instrument was used to generate quantitative data from the firms and to a limited extent some qualitative information which became useful for the case studies which were done later.

The questionnaire was first pilot tested with managers and owners of 8 firms selected randomly outside the study sample. The pilot test was done to assess if the questionnaire was sufficiently focused and adequate to deal with the issues under investigation in an unambiguous manner. During the pilot test period, the questionnaire was refined several times with redundant

or irrelevant questions eliminated. Questions with responses which were found not be very useful or informative were either modified or dropped altogether before the actual survey was conducted. As a result of the pilot process, the questionnaire was considerably reduced in size from what it was initially. A substantial number of questions (about 15%) which were in the original questionnaire was taken out of the final questionnaire which was applied on the 38 firms.

All the interviews were conducted by the researcher with selected personnel within firms, mostly owners and senior managers. Where it was not possible to obtain all the information in one visit, and there were several such cases, follow-up visits were done to clarify certain research aspects and issues. As far as possible during the follow-up visits to firms the same respondents were identified and spoken to. The reason for this is that the whole research exercise is considered as a process which needs to be gradually completed in a logical manner and also building on the information that has already been generated. In order to move forward on the research, on the basis of my own research experience and in particular dealing with SMEs, it is wise to deal with the same respondents when generating information from particular sources. Of course other people within the enterprises can always come in to fill in the gaps if this is needed.

Based on previous research experience, the need to create a good rapport with the firms was considered to be important prior to asking respondents any questions in fulfilment of the requirements of the questionnaire. In this regard, there was an attempt to ensure that the semi-structured interviews would be as free flowing as possible. This necessitated a shift away from the



monotony of most semi-structured interviews. The interviews were conducted in a manner that was sensitive to particular situations of the firms. They were done in a friendly and flexible atmosphere which in some cases gave respondents ample time to attend to urgent issues requiring their attention as the interviews progressed. This was of course done in a controlled and respectful manner without unnecessarily disturbing the flow of the discussion and its focus. The approach adopted helped to strengthen the cooperation of interviewees, even giving a higher level of willingness by the firms to provide additional time for follow-up visits which were mostly welcomed by firms.

Additional questions (which are outside the semi-structured interview questionnaire) requiring further probing were asked depending on the needs and challenges of specific interviews and study firms. The responses given, which were documented as addenda to relevant questionnaires were very useful for the case studies which were conducted later for the four firms involved.

The survey was conducted through interviews by the researcher in person, rather than being a written questionnaire that was handed to respondents to complete in their own time. This approach was chosen so that the researcher could clarify meanings of questions to respondents and ask follow-up questions to clarify and check consistency of responses. At the end of interviews, I checked and cross-checked data on questionnaires to ensure that responses given by those interviewed were valid and consistent, minimizing possibilities of contradictory answers. Data from the questionnaire responses were coded and entered on a statistical package

(SPSS) after thoroughly checking it for errors, validity and consistency. For example, where figures needed to be added up, the total number had to correspond to the sum of individual responses. A good case involves the number of personnel employed in various categories like 'skilled', 'semi-skilled' and 'unskilled' as they relate to the total number of staff employed by a particular firm in various capacities currently and in the past. At another stage, where necessary, computerised data were cross referenced with raw data recorded on the questionnaires to check on possible documentation errors.

A few limitations were encountered during the course of implementing the survey. Firstly, while all of the questions posed initially showed much promise in terms of adding value to the research, in reality some of the questions later proved to be not as useful as originally expected. Accordingly, their analysis did not add much to the analysis of survey results as was expected. This problem seems to be a typical one faced by many structured surveys where traditionally there is often a temptation to collect more data and not less. Researchers also seem to take much time to learn lessons from their practical experiences which are quite valuable. If for example, the same structured survey were to be done again, I actually believe that it could be successfully conducted with fewer questions than those that were on the original questionnaire without greatly diminishing the research findings. Through the structured survey as it was done, an important lesson is that it pays to be more rigorous in scrutinizing questionnaires before carrying out surveys. Pilot tests are useful but as questionnaires are developed they need to be subjected to much rigorous



review, possibly involving a strong peer review process to ensure high quality questionnaires and a good research data set.

#### **3.4.4 How the survey data were used**

Information from quantitative surveys was summarized first in basic format. Quantitative data were run and some summary statistics produced using the SPSS package (see chapter 5). Certain inferences regarding relationships between variables were made from the grouped data and the initial summarized statistical information was used as an input into more detailed statistical analysis provided in chapter 5. The statistical analysis in chapter 5 is based on the following use of the survey data: construction of composite technological learning and networking indices, and a scatterplot; chi-square and regression analyses.

##### **(a) Constructing a scatterplot using composite indices of technological learning and networking and networking**

The scatterplot provided an important initial investigation of the relationship between networking and technological learning and was used systematically to identify case studies (see below and chapter 5). In order to construct the scatterplot, two composite indices were developed for each firm: the technological learning composite representing the dependent variable and the Networking composite representing the independent variable. Both composites combined their respective elements that were highlighted in section 3.4.1. No attempt was made in either composite to weight differently the different elements as objective criteria for such an exercise do not exist. The indices are inevitably simplifications of a complex picture.

Thus, the TL composite combined scores attributed to process adaptation over time, product quality, quality management systems in place, new products and product modifications over time, productivity and investment in research and development. The Networking composite combined scores attributed to Enterprise Support Linkages, Customer Linkages, Supplier Linkages, and Firm-to-Firm Linkages. The exact way of creating these indices is given in Appendix B.

**b) Chi-square and regression analyses**

As discussed in more detail in chapter 5, the Chi-square test was used to check for independence or dependence of 2 variables at a time, the two variables being in each check one of the disaggregated dimensions of TL and networking. Also discussed in more detail in chapter 5, regression analysis is a statistical technique used to measure the explanatory power and sensitivity of the relationship between two or more variables. As with the Chi-square analysis, disaggregated Networking and technological learning variables were tested in relations to each other.

However, an important point which is also emphasized in chapter 5 is that inferences on *causality* come outside statistics from the tacit and the known behaviour of firms. From the statistical analysis viewpoint alone, one cannot establish causal relationships between variables. This is a limitation of statistical analysis and further provides the justification for the use of qualitative research methods adopted in this study, i.e., the case study approach.



### 3.5 Case studies

The scatterplot (see above and chapter 5, figure 5.1) was used to identify case study firms by their varying characteristics. Two firms which tended to support the research hypothesis as well as two which seemed at least to qualify it on the scatterplot were selected.

The four firms selected for case study investigations were as follows:

1. A firm exhibiting high networking capabilities as well as high technological learning (TL) characteristics (supports the hypothesis);
2. A firm with high TL but with relatively lower networking qualities (qualifies the hypothesis);
3. A firm with average networking qualities and relatively low TL (qualifies the hypothesis); and
4. A firm with poor networking qualities and correspondingly low TL (supports the hypothesis).

The research settled for multiple case studies because earlier data collection from the quantitative surveys showed that there were different categories of SMEs which needed to be analysed closely to make the research more revealing. Despite doing a quantitative survey, the researcher perceived that the evidence from multiple cases would be more compelling and the overall study would be more robust than in the case of a single case study (Yin, 1994, p. 45).

The use of multiple sources of evidence during case study investigations allowed the researcher to address a broad range of historical, attitudinal and behavioural issues. These sources included structured interviews, open-ended interviews (formal and informal), focused interviews, observations (direct and participant) and use of some documents that were provided to the researcher by some of the firms. The use of multiple sources also allowed the researcher to triangulate information for consistency, accuracy and reliability. Where it was not possible to access useful secondary information from firms, which was in the majority of the cases, the research had to depend largely on primary sources of information.

Because of differences in firms in terms of the manner information was made available, some case study firms had to be visited more than others. The individual circumstances of the firms varied considerably. Some firms were more ready to assist with information, willing to give the researcher more time during any single visit, allowed participant observations and the use of a variety of techniques in data gathering, collection of information using different ways, for example, talking freely to various personnel and providing more secondary information (see appendix D, case study checklist). In a few cases useful information was gathered from the secondary sources that were made available: business plans submitted to banks, business reports, marketing documents, press articles in the case of some of the firms that had managed to attract the attention of public media in production of business news. In some cases, where it was appropriate, necessary, and possible, some information was also gathered through telephone, facsimile and e-mail contacts. In most cases the information



gathered in this manner involved clarification of queries and other issues where data gaps were identified as the analysis of study information progressed.

In one case, the researcher had to accept less than ideal data because the entrepreneurs involved in the firm were not able to provide the information dating back many years since no proper records existed. In fact this is the firm the researcher assesses to be the worst of the four case study firms in terms of keeping records. This is also the case that had the highest number of study visits and yet the information generated in the end was not as comprehensive as that from the other three cases. Nevertheless, the case provided important contrasting information, to that provided by the other three case study firms. The results from the data collected from the case were thus a useful contribution to the overall research results.

Key informants who assisted in this exercise included owners of the case study firms, their senior managers and workers. Where it was feasible, discussions were also held with some customers of the case study enterprises, and a selected number of representatives of enterprise support agencies, suppliers and other firms within the same sector. Overall, as far as possible and, where feasible, detailed informal discussions were held with as many of the willing stakeholders and collaborating partners of the studied firms as could possibly be contacted. In one case study, a University of Zimbabwe engineer and lecturer who had previously worked with one of the case study firms was contacted and very valuable insights which have been useful in the analysis of the enterprise were obtained.

This data collection approach, which was in some respects opportunistic and flexible (as it depended on particular circumstances) was adopted in order to verify and validate certain perceptions and positions presented by personnel within specific firms. However, attempts to interview the customers of firms and other key network partners were limited by the fact that case study firms were generally quite uneasy about such approaches (e.g., which sought to ask detailed questions about customers), understandably so against a background of stiff competition and a shrinking market exacerbated by the unstable macro-economic environment and declining business confidence. Nevertheless, the process yielded some useful insights which helped inform the study. The results were integrated in the case study analysis presented.

Direct on-site observations carried out within the enterprises entailed an analysis of the behaviour of staff and management and their actions and what they said in non-formal discussions. Some analysis of the available machinery and equipment and production capability was done but to a limited extent. This was because the range and type of technology used by the firms was variable and comparison from one firm to another based on production technology in place tended to be somewhat misleading. This was demonstrated in the case of one case study firm which placed high emphasis upon acquisition of knowledge and skills by its personnel and not upon acquisition of machinery and equipment. The firm exhibited a high level of technological capability and yet its investment in equipment and machinery was quite low relative to other SMEs studied where the latter often demonstrated a much lower level of technological capabilities.



At this point it may be useful to give a quick reflection on how successful the research methodology applied was and also comment on the usefulness of the data gathered in this research. Several options could have been pursued in this kind of research. If circumstances and resources permitted, more time would have been spent doing more in-depth case study investigations, visiting for example, more customers of the various case study firms, their suppliers, some enterprise support organisations and a selected number of firms with which some of the studied firms associated on a regular basis. The fact that it was not possible to do these things in any significant way during the course of this research does not however, invalidate its results. The practical implications of doing them were very difficult in particular against a background where most firms are unwilling to expose themselves unnecessarily to outsiders, including researchers whose motives are not easy to ascertain.

### **3.5.1 The process of designing case studies for the research**

The summary of the case study process adopted is captured in the following diagram. The process started from a stage when after the research problem was identified, a research methodology which among other approaches embraced the case study approach was formulated (see Appendix D). The case study had to be formulated in a systematic manner which had a replication logic<sup>7</sup> (Yin, 1994). A clearly spelt out strategy was put in place as had been done with the design of the quantitative survey. The following

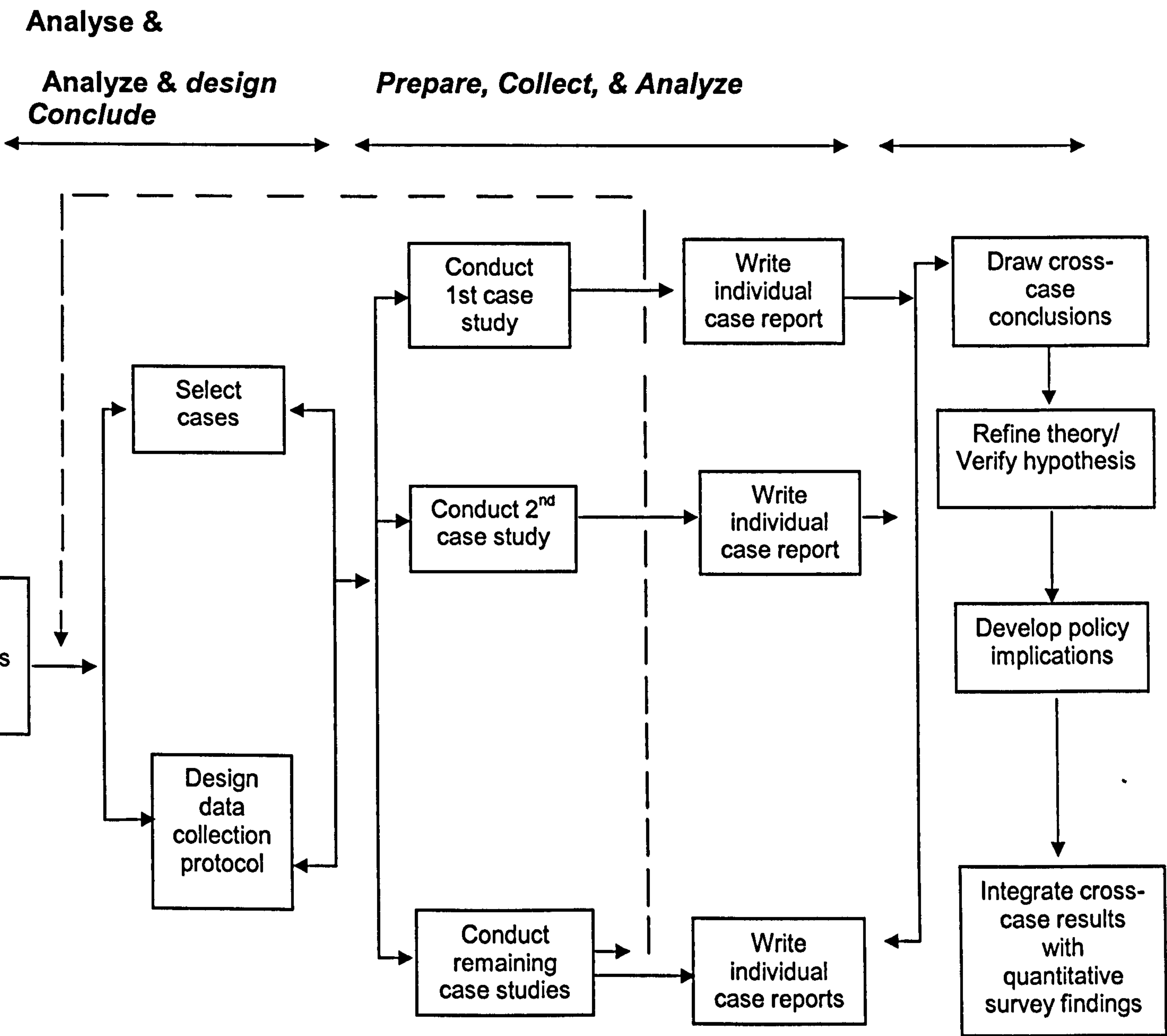
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<sup>7</sup> The reasoning or inference behind duplicating a set of results by means of an identical study.

case study strategy, adapted from Yin, 1994, was adopted.



Figure 3.1: Summary of the case study strategy



Adapted from Yin, 1994

### **3.6 Concluding remarks**

It is clear that there are a number of challenges that confront the type of research carried out. Questions of validity and reliability emerge, in particular with respect to how widely the research results can be generalized. A key challenge is to ensure an acceptable level of statistical generalisation from a sample of firms in the case of structured surveys, and analytic generalization in the case of case studies focusing on much fewer firms. The discussion of quantitative and qualitative approaches favours combining the two research methods. This is perceived to be a more satisfactory way of carrying out such research, at least within the context of this work.

The discussion of difficulties faced by this research in finding suitable proxy indicators and the reasons for developing composite indices is of particular importance. The decision to choose self-perception criteria to assess certain indicators for the sample of firms is also important. Through the use of on-site visits and other observational and informal techniques for cross-checking data, reality checks and probing of respondents, the researcher has taken every reasonable step to ensure that the study findings accurately reflect the situation within studied firms. The kind of data required to study networks and technological learning are presented with fairly detailed discussions of how it was gathered and analysed.

The discussion on sampling procedure for the structured survey should allay fears regarding research bias in selecting firms that are covered by the study. The discussion on how the case study approach was designed and the challenges faced in the design process needs to be noted. The case studies are critical in providing a more in-depth understanding of the firms,



especially their technological status as it relates to networking. Such an understanding cannot come out from the analysis of structured survey data on its own.

Lastly, the degree to which any piece of research can be considered credible depends on the strength of the methodological approach adopted. Care is exercised in this research to ensure that the research methodology adopted meets accepted standards expected of such research. Details of the research instruments used; the questionnaire and case study checklist are presented in the appendices.

## **CHAPTER 4: ENTERPRISE SUPPORT SYSTEMS IN ZIMBABWE**

### **4.0 Introduction**

Before analysing the research results in chapters 5 and 6, it is important to examine a particular kind of network that has historically been associated with enterprise development. This type of network concerns the enterprise support agencies that exist and their relationship (potential and actual) with client firms. Such agencies can be public or private (the latter divided between for profit and not-for-profit agencies) or membership organisations.

The argument of this chapter is that in Zimbabwe there is indeed a proliferation of such agencies, whose mandates include, or have the potential to include, technological support and development. Their input in terms of technological learning for SMEs, however, is generally recognised to be weak for a variety of reasons that are explored in this chapter.

The quantitative analysis in chapter 5 generally corroborates this argument about the weakness of these enterprise support networks. The conclusion in this chapter, however, also points to the need to investigate alternative networks and their contribution to technological learning. These other kinds of network are again analysed in chapters 5 and 6, where they are compared with each other and with networks based around enterprise support agencies.

This chapter, therefore, provides a review of the enterprise support mechanisms in Zimbabwe that have direct and indirect relevance to technological learning for SMEs. The understanding of the breadth and scope of existing mechanisms is important to show why, despite what seems like a solid business development services infrastructure, there remains a missing link in the development support for SMEs



whose technological needs require some focus. This chapter discusses why there are constraints in fulfilling the needs of SMEs, including those covered by this study. An analysis of different categories of actors involved in the enterprise support system is provided.

The diagram overleaf (figure 4.1) shows a framework of the enterprise support system in Zimbabwe. The framework comprises categories of organisational actors, formal and informal, public and private ones. Those captured in the diagram include technical training and research and development services, management and entrepreneurship development programmes, public and private financial services, incorporating commercial and non-bank finance institutions.

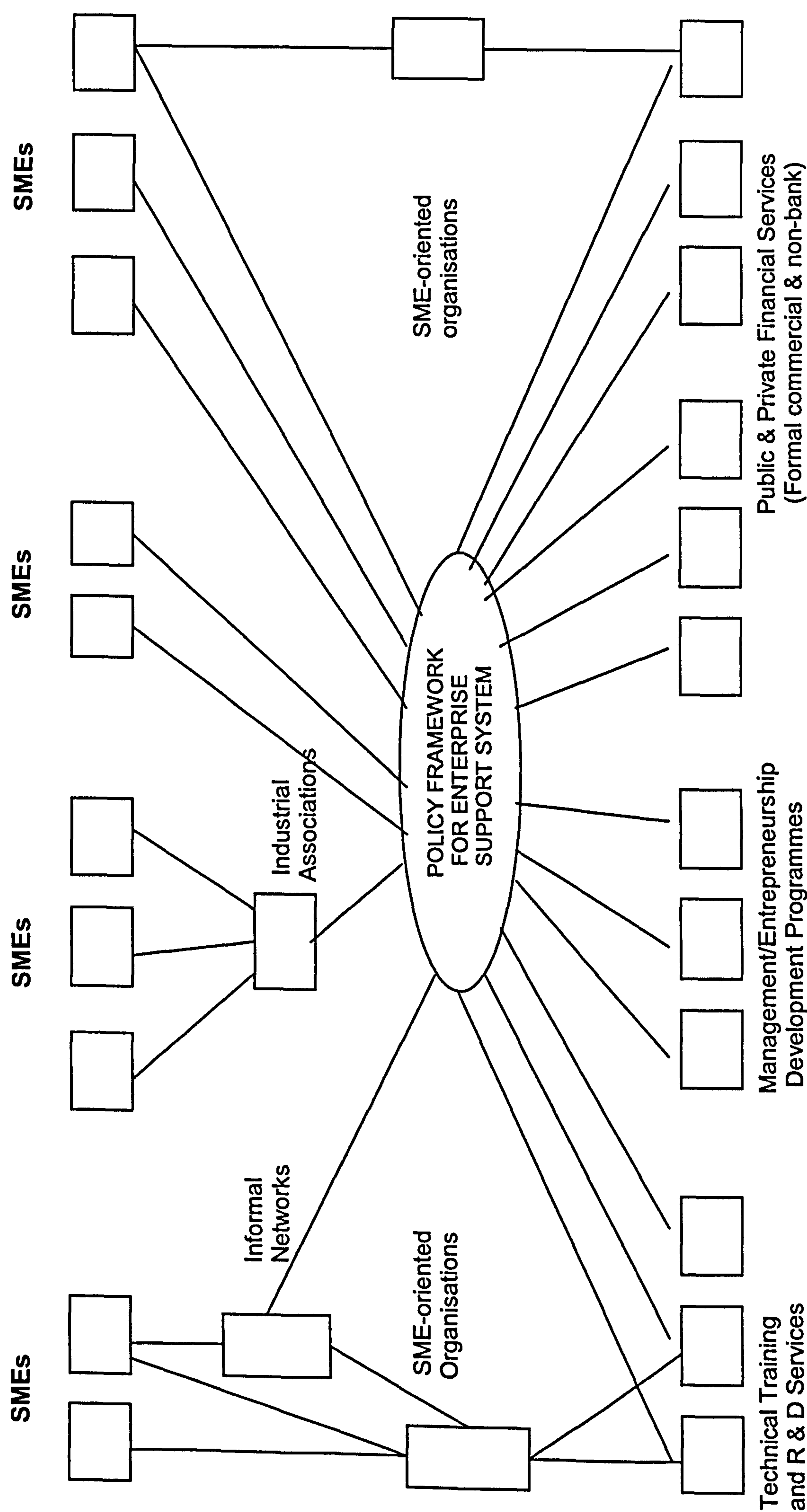
Some SMEs are linked to industrial support associations and other formal institutional structures as stated, others are not. There are also SMEs that are more aligned to informal networks. The extent to which the SMEs or any category of them are linked to any part of the enterprise support system and its components is variable and depends on specific situations and cases. The degree of association is not captured in the diagram.

The policy framework is depicted as central to the manner the enterprise support system works<sup>1</sup>. In fact, the presence or absence of a comprehensive policy on SMEs is perceived to have a major effect on the development of SMEs and the manner in which enterprise support organisations operate in Zimbabwe (JFA-PRESA, 2000, Government of Zimbabwe, 2000b).

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<sup>1</sup> The policy framework for SMEs in Zimbabwe is, however, not well integrated and lacks a holistic approach.

Figure 4.1: Diagram Showing a Framework for SME Support System in Zimbabwe





The Government of Zimbabwe provides the policy and regulatory framework for support to enterprises. This is done through the main state ministries such as Finance and Economic Development, Industry and International Trade, Public Services and Social Welfare and other state supported agencies. The state has historically played a controlling as well as enabling role in the process. However, the recent economic stagnation has exposed the state as a major promoter of politically induced macro-economic instability which, as already mentioned, has led the country to its worst economic performance since independence in 1980 (Chipika, Chibanda, and Kadenge, 2000).

Zimbabwe has a fairly well developed infrastructure of state/public enterprise support systems seeking to promote the development of SMEs in the country. However, there are relatively few agencies in the country working in manufacturing industry-oriented technology development and transfer in comparison to other sectors like agriculture and rural development. While some of the manufacturing oriented programmes are undertaken through the government, a few are being undertaken through both the private sector, which is profit oriented, as well as non-governmental organisations (NGOs), which are not profit oriented. There are examples of both publicly and privately assisted programmes with relevance to the development of SMEs. These are discussed in this chapter and to some extent in chapters five and six. The main justification of the thesis paying considerable attention to these support services in this chapter lies in their potential role in technological and enterprise development as a whole which is regarded by both scholars and practitioners as critical (SBP, 1999; Mongula, 1995; Huggins, 1995; UNIDO, 1998).

Chapters 5 and 6 present the picture in terms of the extent to which certain enterprises actually do benefit or otherwise from their interactions with a variety of actors, including enterprise support organisations. The findings in these chapters strengthen the justification for having a chapter devoted to enterprise support services since those findings both reinforce and qualify the observations and conclusions made here.

#### **4.1 State/public support agencies**

As a policy guideline state assisted support agencies serve both large and small firms operating in various sectors. However, traditionally a substantial proportion of the financial resources have been channelled to support the larger enterprises with much fewer contributions towards support for SMEs. Whilst in previous years SMEs have only obtained a tiny proportion of state support, these enterprises have in recent years received renewed attention from government agencies with some donor funds mobilized in support of them being executed through a number of government departments. This has occurred against a background of high levels of unemployment with a growing number of people including professionals joining the SME and informal micro-enterprise sector.

Examples of state facilitated programmes include specially funded projects carried out through the Ministry of Public Service, Labour and Social Welfare and Ministry of Youth, Gender Development and Employment Creation. The Ministry of Industry and International Trade has also overseen a number of SME centred programmes implemented through organisations representing the private for-profit firms. The state has provided co-funding to some of the programmes as well as technical support. The purpose of the



support has been primarily for poverty alleviation (employment creation) in the case of micro-enterprise development and to some extent business development in the case where support is given to the more entrepreneurial small scale manufacturing sector.

Potentially a number of state supported agencies, namely the Scientific and Industrial Research and Development Centre (SIRDC -- a major industrial research and development organisation in Zimbabwe), the Standards Association of Zimbabwe (SAZ) and a number of tertiary and educational organisations have potential to play a great role in the development of manufacturing industry in the country. Such a role entails facilitating a process that could meet the technology development needs of SMEs through the mobilization of government and donor financial resources through specific institutional mechanisms.

To some extent, state supported programmes have been reasonably proactive in reaching out to their target groups. Resource constraints have however, limited their outreach activities to a large extent. Public organisations have always been known to be poorly resourced which is one of the major reasons for their failure to fulfil their stated mandates. A related concern is that the sustainability of state supported programmes depends a great deal on substantial government and donor assistance which in recent years has been diminishing. There is an absence of good alternative funding mechanisms which are more sustainable. These have not been adequately catered for in the planning process.

The approach of many state assisted organisations, in particular those with a mandate for research and development and provision of technological development services, is one which makes it difficult for the agencies to be

accessed by large numbers of small and medium scale enterprises while larger enterprises seem to have gained disproportionately from the existing support services offered.

Recent surveys of Zimbabwean manufacturing firms indicate that the role of state supported agencies in general has yet to impact upon large numbers of firms, large or small (IDRC, 1996a; Zimconsult, 1999). The Zimbabwean situation is not very different from other countries in sub-Saharan Africa. For example, in Ghana, while there is a wide array of research and development and science and technology agencies, but many of them have very poor linkages to the manufacturing sector and none seem to employ a holistic approach to the technological innovation needs of SMEs (CIED, 1996; 1999). Many state supported scientific and industrial research organisations in Africa have found it difficult to respond to the technological needs of manufacturing firms, in particular small and medium enterprises (CIED Ghana, 1996). There is a general feeling that many African countries are actually not reaping the potential benefits from the huge investment in human resources and physical infrastructure of government funded agencies. Many of these organisations have remained unproductive 'white elephants' without any significant value adding role for manufacturing industry, especially SMEs (UNIDO, 1998). In South Africa, the National Productivity Institute (NPI) and the Council for Scientific and Industrial Research (CSIR), both of which were created during the apartheid era have largely remained unable to respond to the technological development needs of SMEs, catering mainly for the large scale sector (Emcoz, 1999; Zwizwai, 1996). In the other African countries like Cote d'Ivoire, Kenya, Senegal and



Tanzania, the situation is not very different from that in Ghana and Zimbabwe (IDRC, 1996; CIED Ghana, 1996).

The perceived low level of entrepreneurship and general lack of dynamism in Zimbabwean industry is also tied to inappropriate supply led education and training programmes and poor technological skills formation which date back to the colonial era. More than two decades after attainment of independence, the problems remain unresolved. In the first instance, many of the existing programmes have been designed to produce employees and not entrepreneurs (Government of Zimbabwe, 2000). According to my own information and knowledge, many of the existing breed of successful entrepreneurs in Zimbabwe started off as employees, going into business as a last resort or on a trial and error basis. Over the past decade, however, a positive trend has been entry by a greater number of a new breed of a well educated indigenous entrepreneurial cadres into the manufacturing sector (IBDC, 1997). It is expected that over time, more demand oriented and technologically focused human resources development programmes will be initiated for the benefit of indigenous manufacturing entrepreneurs.

#### **4.2 Private not-for profit support agencies**

Private not-for profit organisations involved in technology development include both national and international agencies which have been involved with enterprise development over a long period. These organisations serve mainly micro-enterprises in the informal sector and not the dynamic and entrepreneurial small scale manufacturing sector. They are generally aimed at poverty alleviation through the creation of jobs for the disadvantaged and to some extent business development, rather than technological learning for

more dynamic and established enterprises. They are fairly pro-active, but fragmented, and although reasonably resourced individually they cannot make that much overall impact. For example, over the past 17 years, GTZ, a German Development Agency, has been promoting an integrated approach to the development of micro-enterprises especially in rural areas. GTZ programmes have been quite well resourced but have been very localized within limited geographical areas, often in one or two districts in a whole province or roughly less than 10% of a region. A number of NGOs like the Intermediate Technology Development Group (ITDG) work with local agencies to develop and promote appropriate forms of technology which build on the skills and resources of disadvantaged indigenous entrepreneurs. In the case of projects supported by ITDG, it has emerged that whilst some urban and rural enterprises have been reached with the organisation's enterprise support projects, outreach to large numbers of entrepreneurs has not been as high as desired (ITDG, 1995). Resource constraints by the individual agencies with limited capacity to tackle a large number of areas of opportunity for small scale enterprises has been evident. As discussed in chapter 6, it is acknowledged that some firms which have managed to interact with specific enterprise support agencies have benefited from their services. This situation cannot, however, be generalised as applicable to most enterprises.

Managerial training and business development support agencies are an important category of private not-for profit support services. They are critical to the development of SMEs in Zimbabwe. Lack of basic skills like planning, costing, production management, marketing, bookkeeping and others have acted as a constraint on the development of small firms in Zimbabwe. In



part this may be an effect of historical legacy. Until recent years there was no real culture of entrepreneurial enterprise within the indigenous population, with only limited opportunities to develop business skills. Furthermore the academic nature of Zimbabwe's education system is not conducive for preparing people for the enterprise development and innovation required of entrepreneurs, nor the skills needed to enable them to run successful manufacturing enterprises.

In Zimbabwe, on the job training in such skills is available via private not-for-profit support agencies, universities, polytechnics and private colleges and other private sector and NGO supported programmes. However, the evidence of the effectiveness and adequacy of such arrangements is mixed with doubts about the accessibility, suitability and sustainability of the training programmes offered to small and start-up businesses. One seemingly common weakness of business support organisations has been their limited coverage of the SME population in Zimbabwe. Most of these organisations do not have more than two branches, which are usually located in the country's two leading cities, Harare and/or Bulawayo. The majority of SMEs in other towns, outlying areas and rural areas are thus excluded from vital training courses and counselling unless they are prepared to meet the extra transport costs that come with the trip to 'head office'. Another constraint associated with not-for-profit management training support organisations from an analysis of their operations is the fact that their advice appears to be too general. Cases have occurred where specific management decisions have to be made or designed along the particular interests of a firm in a particular sub-sector and yet most of the

support organisations do not have specialised personnel to assist such SMEs (Zimconsult, 1999).

Both urban and rural indigenous entrepreneurs continue to face many constraints in establishing small-scale ventures, in particular the more challenging manufacturing enterprises. Access to information - about technologies, potential markets, equipment, credit and business assistance - are major constraints. More often than not, local organisations and potential entrepreneurs have to learn business and marketing skills from scratch. Disadvantaged small scale entrepreneurs face problems of obtaining appropriate equipment and, in particular, access to credit has often been almost impossible for most SMEs. Private not-for profit organisations are generating some experience of providing appropriate forms of support which recognise that in order for technologies to work and have a greater impact, there is an important need to address other issues related to the development of enterprises in general. The approaches recognise the need of clientele and target groups to have access to development packages that help stimulate small businesses and employment in marginal areas (Zimconsult, 1999; Chipika, 1995).

As previously noted, however, private not-for profit support services tend to emphasize the provision of specific technical assistance and options in particular sectors and technical areas, mainly for the marginalized informal sector enterprises, with less attention paid to higher demanding enterprises (ITDG, 1995; CIED 1996, 1999). The long-term roles of private not-for profit agencies in endogenous technological capability building has not been sufficiently developed. The agencies are important, however, in providing 'free' technical support in terms of information, advice and training to small-



scale entrepreneurs focussing upon specific technical activities such as the training of artisans or informal sector entrepreneurs in new skills, and the procurement of machinery and tools to produce and provide specific goods and services.

Relevant programmes in Zimbabwe also generally lack a clear focus upon high growth and high potential SMEs. A large proportion of growth oriented SMEs seems to be ignored, this being so because of the nature of the projects supported in a developing country like Zimbabwe. Moreover, there is no clarity about how to deal with those enterprises that seek to scale up and graduate from small scale and micro enterprises to larger and more demanding scales of operations and complex processes. The apparently undeclared position of most private not-for profit programmes is that these 'graduates' should seek assistance elsewhere from other actors in the private sector. There is therefore a subtle abandonment of this category of entrepreneurs. This poses a problem for those entrepreneurs seeking to scale up.

#### **4.3 Private for-profit support organisations**

Private for-profit organisations have in previous years concentrated mainly but not exclusively on large firms which have the capacity to pay for the services provided. This is in line with the profit accumulation objective of such organisations. As demand for services from large enterprises has shrunk with continued economic decline in the country, the agencies have turned to smaller opportunities with SMEs. In recent years there has been a proliferation of small private consultancy firms as large numbers of professionals in the formal sector became laid off. This category also

incorporates an increasing number of individual consultants, many of whom are disguisedly unemployed because of the economic downturn in which the economy has experienced negative growth in most sectors in recent years. Small consultancy firms often concentrate on small contracts, usually short-term, designed to provide specific support to micro-enterprises, including the more dynamic enterprises in the formal small scale manufacturing sector. Support offered by private for-profit agencies is often targeted at business development for those SMEs that are perceived by the service providers to have a high potential for growth and development and are able to pay in return for particular services provided. This category of SMEs includes enterprises involved in value added activities which have a certain degree of technological sophistication. Major support to small and medium firms, however, often covers sectors and not individual firms, with aid agencies meeting the bulk of the expenses for the provision of special consultancy services. Lately the concept of matching grants for SMEs has been adopted. This involves a situation whereby donors meet 50% of the cost of consultancy support to SMEs in special programmes, while the other 50% is met by the SMEs themselves. Traditionally very few SMEs have ever hired consultancy firms individually, mainly because of failure to afford to meet the cost of such services. Yet there is now a growing belief among many SME development practitioners and promoters that targeted private-for profit services can be instrumental in increasing the competitiveness of small scale firms.

More established private for-profit organisations are often very pro-active in reaching out to their clients, in particular because their survival depends on the amount of money they generate from the jobs they carry out.



Individually a few of the individual organisations have assisted local firms to become more competitive. This has been achieved by facilitating client enterprises to attain recognised and documented international standards like ISO 9000<sup>2</sup> through collaborative efforts extending over considerable periods, in a spirit of partnership. A typical example, is XS Consulting Private Limited, a local consultancy group which has in recent years assisted several small and medium sized firms to achieve international standards of quality and service. Several other consulting firms have collaborated with the Standards Association of Zimbabwe and other actors in a similar manner with good results achieved not only in the management of technology but also in other key performance areas that are of critical importance to manufacturing enterprises.

Consultants' inputs make an important contribution to technological learning in a wide range of the country's sectors, including indigenous enterprises. The Association of Zimbabwe Consultants (AZIC) and the Zimbabwe Development Consultants are examples of some of the groups that are seeking to represent the consultancy profession. On the technical front, the Zimbabwe Institute of Civil Engineers (ZICE) is the oldest engineering association in Zimbabwe. It mainly represents the interests of civil and structural engineers, while having a small representation from engineers of other disciplines in mechanical, electrical, chemical and mining engineering who attach greater importance to membership of foreign engineering organisations. Other consulting groups include the Zimbabwe Association of

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<sup>2</sup> This is an international reference for quality management requirements in business-to-business dealings established by the International Organisation for Standardization.

Consulting Engineers (ZACE) and the Zimbabwe Institute of Engineers (ZIE), with interests in provision of general engineering consulting services.

Limited attempts have been made to link Zimbabwean consultants through consultants' registers and the dissemination of information through public media and formal gatherings. What is clear though is that, as consultancy opportunities have diminished with the harsh macro-economic and political environment, there is more intense competition among individual consultancy firms, both large and small, for limited opportunities with costing considerations taking centre stage. In many cases, quality services are compromised as potential clients opt for low cost inputs (Zimconsult, 1999).

A major issue with private for-profit support services, and consultancy services especially, is that they are largely perceived to be traditionally elitist, paying little or no attention to the practical demands of SMEs. Although the situation has changed over the years with increasing emphasis placed upon small scale industries by both government and donors, most indigenous firms or their representative organisations are known to lack the resources and capacity to engage consultants outside the framework of external assistance programmes. Consultancy services are generally perceived to be expensive and unaffordable to most SMEs. Because of this, dependency on externally supported programmes by both providers of consultancy services and potential SME clients is actually a cause for concern, since such initiatives usually cover small numbers of companies or beneficiaries and also are clearly not sustainable.

Away from consultancy, however, private for-profit support services are potentially a viable option for the technological development of the more innovative SMEs which are willing and able to meet the cost of service



delivery, at least in terms of hardware innovation. In fact, most hardware technologies which pass the testing stages of the state assisted support organisations and some private not-for profit support services are often taken up by private for-profit companies during the commercialisation and dissemination stages. This has been so in the case of a few examples of technologies that have been promoted by organisations like ITDG and Appropriate Technology International (ATI) supported programmes<sup>3</sup>. After the development of prototype equipment and machinery, private firms have been engaged in the manufacture of certain equipment and machinery in large quantities for sale to SME customers and others in the open market. This private for-profit hardware services route is considered to be more sustainable than the approaches adopted by publicly supported agencies or private not-for profit services which are heavily subsidised by government and or external donors for limited periods but which also cannot maintain a sustained commitment to hardware development. In any case the outreach of state supported organisations and private not-for profit services involved in enterprise development in the country is known to cover only a small number of beneficiaries. The rationale for state assisted and private not-for profit service delivery mechanisms is to demonstrate success and good potential for replication and dissemination during the initial pilot phases for subsequent wider dissemination and commercialisation during the post-pilot phases. The dissemination and commercialisation phases are often handled sustainably by private for-profit support organisations.

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<sup>3</sup> A number of projects have been supported through these organisations with the aim of promoting technological development and the dissemination of new practices which are affordable to SMEs.

#### **4.4 Membership organisations**

In private industry there is a widespread belief that the interests of private firms engaged in productive activities can only be properly represented by membership organisations representing the enterprises. Membership organisations have been known historically to play an important role in supporting enterprises of various sorts in Zimbabwe, including those covering the manufacturing sector. How well that role is being played has been subject to scrutiny in recent years, however.

A number of membership organisations have in the past been established in the country with a view to lobbying for the improvement of the operational environment of enterprises. The most well known membership organisations are the Confederation of Zimbabwe Industries (CZI) and the Zimbabwe Chamber of Commerce (ZNCC). The two organisations have historically tended to represent the interests of larger enterprises although the situation has changed somewhat over the past decade as interest in SMEs has grown (CZI, 1998). Some changes have since taken place within the structures of the membership organisations to reflect that they do have interest in SME development issues.

The criticism that these key membership organisations have failed to champion the interests of indigenous enterprises adequately gave rise to a new membership organisation, the Indigenous Business Development Centre (IBDC) which was also represented by its technical arm, the Business Extension Advisory Services (BESA) (Zimconsult, 1999; IDRC, 1996b). A less well known membership mechanism is the Small Enterprise Advisory Group which draws its members from various stakeholders with interest in SME development. The Group irregularly convenes seminars and



workshops which centre upon specific issues associated with SMEs. Important observations about membership organisations in relation to SMEs are as follows:

- They cover SMEs as a group and in general have no special interest in manufacturing SMEs, with the exception of the CZI.
- Whilst exchange of ideas and information takes place between and within the organisations through some basic inter-organisational collaboration, follow-up of key issues with practical initiatives has often been elusive. Follow-ups by individual organisations has often been limited because of the priorities set within each member organisation. Such priorities often deviate from the commonly defined agenda for reasons that are connected to low capacity and constraints arising from the limitation of resources to initiate and engage in effective outreach activities (UNIDO, 1998).

Following further criticisms that the existing membership agencies failed to represent micro-scale entrepreneurs, more informal sector oriented associations have since emerged over the past decade. This last group of membership associations however, is not so well structured and developed as the other associations particularly because it is even more poorly resourced financially with relatively little financial contribution from members who are largely considered to be poor.

As already alluded to, the better known membership organisations such as CZI and ZNCC have tended to focus upon large scale enterprises because their original mandate was to represent such enterprises (CZI, 1996 ,1998). Although there are some positive signs in recent years in terms of championing the interests of SMEs, it is not quite clear to what extent these

organisations can be said to represent fully the interests of SMEs. The fact that a growing number of SME centred projects have in recent years been executed through the agencies is a move in a positive direction. However, the projects that have been set in motion to date are somewhat limited in scope and in terms of geographical coverage, leaving a large number of SMEs excluded.

Membership organisations in the country are fairly pro-active in that in order to survive they depend on the resources of members who have to be mobilized through the public media and direct communication in order to remit timely subscriptions. Unlike other agencies, membership organisations in Zimbabwe tend to be more demand oriented because of the pressure from members who often desire to see results from the efforts of the organisations that they sustain through their financial contributions. In fact, membership organisations are very much focused upon the improvement of business development, which is their core business (CZI, 1996; 1998). Other issues like poverty alleviation and employment creation, which are central in the case of state assisted organisations and private not-for profit organisations are at the periphery. The purpose of providing support to enterprises therefore varies from one category of support agencies to another.

Membership organisations also tend to be more preoccupied with short-term issues and often seem to fail to articulate important development roles which relate to enterprise competitiveness. My view is that largely because membership organisations see themselves as advocates for a more conducive policy environment, they make little or no emphasis upon other key micro-level enterprise development issues like enterprise learning,



innovation and networking. The belief is that enterprise level issues are better pursued by the enterprises themselves. The present challenges posed by the global economic environment have however, heightened the need for more collective efforts by enterprises to solve common constraints, where some of the key issues are directly to do with the technological advancement of enterprises.

In recent years, most of the more established agencies have experienced high levels of membership loss as many companies have closed down due to macro-economic difficulties. The financial resource base of the organisations has also declined which has implied a scaling down of activities. However, in general these organisations have remained quite resilient against a harsh economic environment and continue to play quite an important role nationally and in serving the interests of their members.

#### **4.5 Financial institutions**

Financial institutions have potentially an important role to play in the process of technological learning for SMEs and in the development of small scale enterprises as a whole even when this is not their core function. The best known financial services serve the commercial and industrial formal sector enterprises which mainly cater for the needs of the more successful large and medium sized firms. Financial institutions serving the interests of SMEs, both formal and informal, have historically been few and under-resourced. The purpose of the little support to SMEs that has been offered has been to strengthen the enterprises to enable them to scale up and create more jobs.

Despite the availability of small business support 'windows' by a growing number of established commercial banks over the past 10 years, in reality there has been little flow of resources to manufacturing SMEs in relation to the resources made available to the large scale sector activities in the economy (ADB, 1997; JFA-PRESA, 2000). Linkages between the financial sector and the technological development process have also been very poor. Historically financial institutions in Zimbabwe have been heavily biased against SMEs, and in particular have had little or nothing to do with financing of technological development.

As small and medium scale indigenous firms now constitute a growing potential client base for financial institutions, an understanding of the technological development needs of this sector becomes critical. Of great interest has been a growing number of indigenous players in the financial services sector since its liberalisation. Despite these developments the impact of the new players in terms of targeting of financial resources on the technological needs of SMEs within the manufacturing sector has remained largely unknown and undocumented (JFA-PRESA, 2000).

With the exception of a small number of financial institutions, the agencies involved in the provision of financial services to SMEs have not been very pro-active in reaching out to their target groups. The relationship between SMEs and financial service providers has generally been weak with a large number of enterprises not covered. It can be argued that it is precisely because these relationships are not sufficiently strong that partly explains why SMEs have been marginalized in the provision of technologically vital financial assistance. The role of financial services is of such tremendous importance that in many developing countries policies and strategies



designed to target financial resources to the SME sector have been adopted (ADB, 1997; KITE, 1996). In many cases this has been done through the creation of new institutions with a clearly defined mandate to target SMEs of various sorts.

Against the background, the need for stronger linkages between financial services delivery system and the technological base of a developing country like Zimbabwe becomes paramount if financial institutions are to play a more prominent role in technological learning for SMEs. This becomes even more crucial against the background of reduced state contributions towards research and development programmes and innovation oriented activities, making the search for alternative funding mechanisms to facilitate technological development even more urgent. It is, however, hoped that the mushrooming of new indigenous banks, including those that are specifically targeted at women entrepreneurs, should improve the situation as the financial sector becomes more competitive.

Commercial financial organisations have put across several arguments why they have not been forthcoming in supporting many indigenous enterprises, a situation that has hindered the development of technological capabilities of predominantly Black owned enterprises (JFA-PRESA, 2000; AFC, 1996).

These arguments include:

- Financial organisations assert that SMEs lack in the application of sound management techniques - for instance, many of them are alleged to be failing to distinguish whether they are making a profit or not, making it difficult for banks to support their operations;
- It is also alleged that SMEs typically lack the required level of technical skills, particularly so for high demanding industrial projects;

- There is also concern in financial circles that SMEs are not able to market their products effectively in a highly competitive market environment. Due to their lack of competitiveness, banks argue that the ability of these enterprises to penetrate high demanding markets is low.
- With reference to rural based enterprises, the lack of experience of indigenous entrepreneurs based in growth points and rural service centres to manage sophisticated projects adequately is also perceived to be a major stumbling block.

The re-focusing of financial services support to SMEs is critical following the argument that forms the background to this thesis – that lack of technological dynamism is a major constraint on SMEs becoming full players in the economy (and therefore lucrative customers of the financial institutions).

Such support can be in the form of what financial institutions usually give loans for – capital equipment, in other words hardware. In order to gain such a loan every firm has to justify the purchase of the hardware, which, at least by proxy, will indicate technological learning. Once the loan is granted and the hardware purchased, it will sometimes come with a training package and an after-sales technical follow-up.

Of relevance to the network theme of this study, customers of financial institutions can and do build relations that establish trust over a long period. With the establishment of trust, advice can flow and the process of gaining loans is lubricated to some extent.

Financial institutions can therefore also become part of networks of technological learning to varying degrees depending on particular situations and levels of interactions with client firms and their representatives.

#### 4.6 Concluding remarks

Despite the existence of what seems like a fairly well established support system for enterprises in the country, there is little available evidence that large numbers of SMEs, including light engineering firms are benefiting from the existing enterprise support infrastructure in any significant way.

The reasons given in this chapter for such lack of support, especially technological development support are:

- Lack of resources;
- Lack of commitment;
- Bias against SMEs;
- Where they do provide support for SMEs, it is usually conceptualised as poverty alleviation through job creation rather than enterprise development, and;
- Fragmented coverage of the sub-sector.

Apart from the first of these reasons (lack of resources) the weak input of these agencies may be conceptualised as *network failure*, both in terms of networking between the different support organisations (where success would result in synergies being achieved in a coordinated effort) and between the support organisations and their clients.

The enterprise support systems environment within which SMEs operate needs to be interrogated further at micro-level in order to establish how this impacts upon the behaviour and performance of SMEs at an operational



level. However, although SME support systems are not the only focus of the thesis, the foregoing discussion provides an important context for the research.

Indeed, chapter 5, which follows confirms through the quantitative research results the general observation from this chapter that SMEs do not in general benefit from the enterprise support organisations that exist. Chapter 6 meanwhile provides examples of enterprises that have both benefited and not benefited. Chapter 6 therefore suggests some lessons for a more beneficial interaction between enterprise support organisations and SMEs. The general failure of enterprise support organisations to support SMEs, however, also makes it important to examine other kinds of network that may support technological learning, which again is taken up in chapters 5 and 6.

## CHAPTER 5: QUANTITATIVE ANALYSIS OF RESEARCH RESULTS

### 5.0 Introduction

Chapter 5 starts by presenting an overview of the basic characteristics of the sample of 38 light engineering firms. The rest of the chapter then summarises and analyses results from a scatterplot, correlation, cross-tabulation (chi-square analysis) and regression analysis based on a number of variables, designed to show how networking is associated with technological learning. Progressive statistical analysis is conducted as follows:

- Use of a **scatterplot**, which establishes or investigates general association between networking and TL composite indices;
- Use of the **linear correlation coefficient** which measures the strength of the linear association in the scatterplot;
- Use of the **Chi-square test**, which goes further to check independence or dependence of 2 variables at a time. The variables are respectively the individual (disaggregated) dimensions that have formed the composite networking and TL indices; and
- The last stage in the progressive statistical analysis is **regression analysis**, which measures the sensitivity of the association between two or more variables that were used in the Chi-Square test.

The progressive analysis builds up the statistical evidence in support of the research hypothesis and provides additional insights. Before this analysis, however, I present a basic overview from the survey results.

## 5.1 Sample overview/basic characteristics

**Table 5.0: Background characteristics of firms**

<b>Number of Years Firm has been Operating</b>		
<b>Period</b>	<b>No. of Firms</b>	<b>Percentage of Sample (%)</b>
Since the Economic Reform Programme began in 1991 (2-10 years)	29	76.3
Since before Economic Reform Programme began in 1991 (11-50 years)	8	21.1
Not Known	1	2.6
Total	38	100
<b>Ethnic Origin of Owners</b>		
	<b>No. of Firms</b>	<b>Percentage of Sample (%)</b>
African	32	84.2
White/European	5	13.2
Other	1	2.6
Total	38	100



Table 5.0 shows that a large proportion of the firms in the sample were 10 years or less old at the time of the field work, indicating that most of the firms were established after the implementation of the Economic Reform Programme (ERP) which started in 1991. The hardships experienced under the ERP, especially in employment losses in the formal sector contributed to the growth of the informal sector, including light engineering enterprises as more people sought alternative sources of livelihood. In fact it is noted that a large number of entrepreneurs managing the firms studied are former employees of large formal enterprises. Many of the SMEs studied started off as informal enterprises but have since graduated to become formal enterprises although still remaining small. Also some new opportunities which coincided with the adoption of the ERP, but which were not necessarily a result of it; emerged which allowed entry by small scale entrepreneurs into several productive areas of the economy including the light engineering sub-sector. Other areas include various activities in repair and maintenance, garment and textiles, woodworking and furniture and agro-based enterprises.

Table 5.0 also shows that the overwhelming majority of the enterprises studied (84%) are owned by Black Africans with only 13% owned by former white colonizers and their associates (mainly other Europeans). This is in keeping with the focus of the research which is upon indigenous owned SME light engineering firms.

Table 5.1a shows the product and process changes that are associated with different kinds of network for each firm. Insofar as these changes are an

outcome of technological learning, they may also be described as proxy indicators for technological learning, and indeed the later statistical analysis in this chapter is based on a similar assumption.

**Table 5.1a**

**Typology of product and process changes (as proxy indicators for technological learning) that sample firms associate with different types of network**

Firm Code	Customer networks	Supplier networks	Enterprise support networks	Firm-to-Firm networks
01	Upgrading of existing products Introduction of new products Improvement of quality to products	Minor improvements to products	Minor improvements to products	Design of new products Diversifying products Improvement of quality to products
02	Upgrading of products Introduction of new products Improvement of quality to products	Minor changes to products	Upgrading of products Design of new products Diversifying product range Improvement of production process Quality awareness	Introduction of new products (through sub-contracting arrangement with large firm)
03	Upgrading of existing products Introduction of new products Improved product quality	Minor improvements to products	Development of new products (especially agro-processing equipment and machinery) Improved production process	Improved marketing capability Improved production process

04	Upgrading of products Introduction of new products	Minor improvements to products	Minor changes to products Identifying of export markets	Minor upgrading of products Diversifying product range
05 (Classic)	Upgrading products; Improvement of product quality; Improving product diversification	Nothing quite specific	Learning to produce new products and improvement of design capabilities	Limited, but highly valued changes to products; Improvement of product quality
06	Upgrading of products Diversifying product range	Minor improvements to products	Development of new products including designs	Relationship with large firms especially assists the firm to develop new product lines and improve its production process
07	New product designs Diversifying product range	New product designs Improved production process	Design of new products Improvement of production process	Design of new products Upgrading of some products
08	Minor improvements to products	Minor improvements to products	Nothing specific	Production management Quality management and awareness
09	Upgrading of existing products New product designs	Nothing special	New product designs and development Diversifying product range (through sub-contracts) Product quality improvements	Improvement of product quality Diversifying of product range
10	Upgrading of existing products Diversifying product range Improvement of product quality	Minor improvements to products	Minor improvements to products	Upgrading of existing products Management of product quality



**Table 5.1a continued**

11	Minor changes to products Improved quality of products	Minor changes to products	Nothing specific	Changes to production process through links with large engineering firms
12	Upgrading of existing products Diversification of product range Improved product quality	Minor changes to products  Diversifying product range	Changes to production management Quality management	Changes to production management methods Upgrading of existing products Diversifying of product range
13 (Dynamic)	Production of new products; Improvement of product quality	Introduction of new products; Learning to use some raw materials to make better quality products	Increasing diversity of products Upgrading products and quality Cleaner and environment friendly production methods	Useful but limited improvement of quality of products Improved product diversity
14	Upgrading of existing products Changes to product quality	Minor changes to production management process	Nothing specific	Upgrading of existing products Minor changes to product quality
15 (informal)	Nothing specific	Nothing specific	Nothing specific	Learning to produce (process adaptation)
16	Minor changes to product designs	Minor improvements to products	Nothing specific	Changes to product quality Upgrading of existing products Productivity improvement
17	Upgrading of existing products Minor changes to products	Minor modifications to products	Minor production process changes	Production management Product quality changes

**Table 5.1a continued**

18	Upgrading of existing products Diversifying product range Product quality changes	Minor modifications to products	Nothing specific	New methods of production Improvement of quality of products Diversifying product range
19	Diversifying product range Improvement of product quality	Minor modifications to products	Improved product quality Production management methods/upgrading existing methods Diversifying product range	Diversifying product range  New product designs (copying other firms)
20	Upgrading of existing products Diversifying product range	Nothing specific	Product quality changes Upgrading of existing products Diversifying product range	Changes to production process
21	Upgrading of existing products Diversifying product range	Minor changes to products	Upgrading of existing products Diversification of product range Improved production process and product quality	Nothing specific
22	Minor changes to products	Upgrading of products	Minor changes to products	Nothing specific
23	Minor changes to products	Upgrading of products	Minor changes to products	Minor changes to products
24	Upgrading of products Improvement of product quality Diversifying products	Minor changes to products	Upgrading products and the production process Improving quality of products	Upgrading of products

**Table 5.1a continued**

25	Upgrading products Diversifying product range	Minor changes to products	Upgrading production process	Minor changes to products
26	Minor improvements to products	Minor improvements to products	Nothing specific	Nothing which can be traced
27	Product quality improvements Diversification of products	Minor improvements to products	Nothing specific	Nothing specific
28	Upgrading of products Improvement of product quality	Minor improvements to products	Design of new products	Diversification of product range Improvement of product quality
29	Diversifying product range	Minor improvements to products	Minor improvements to products	Minor improvements to products New production methods
30	Upgrading of existing products Diversifying product range Improvement of product quality	Diversifying product range Upgrading of existing products	Design of new products Improving production process Improving product quality	Upgrading of existing products Minor improvements to products
31 (Average)	Introduction of new products; Improvement of product quality	Nothing really specific	Product diversification	Introduction of some new products (copied from competitors)
32	Upgrading of product quality	Minor improvements to quality of products	Nothing specific	Minor changes to products
33	Upgrading of product quality	Minor changes to products	Nothing specific	Design of new products



**Table 5.1a continued**

34	Improvement of product quality Diversifying of product range	Minor improvements to products	Minor improvements to products	Minor changes to products
35	Upgrading of existing products Improvement of product quality	Upgrading of products Minor improvements to products	Upgrading of existing products Improving product quality	Design of new products Upgrading of existing products Improving quality of products
36	Minor improvements to products	Minor improvements to products	Nothing specific	Nothing specific
37	Minor improvements to products	Nothing specific	Nothing specific	Minor improvements to products
38	Upgrading of existing products Improvement of product quality Diversification of products	Minor improvements to products overall	Nothing specific	Improvement in product quality Design of new products

According to the Table 5.1a, customer networks seem to be the most pervasive contributor across a range of technological learning indicators, followed by firm-to-firm and enterprise support networks. Supplier networks seem to be least in importance.

The table, however, only provides a rough indicator of what kind of learning each of the networks contributed to. It is only in the case studies chapter where there is an elaboration of the importance of the various networks to learning. It is also noted that although supplier networks seem to be not as important (see

also table 5.1b), their importance is closely linked to customer networks, as explained elsewhere in this thesis. Without good supplier networks which can guarantee good supplies of inputs and raw materials and thus ensure sustained production for customers, relations with customers would be weak, hence weak customer networks would be the result.

Table 5.1b provides a simple aggregation of the data in Table 5.1a to give a rough guide to the contribution of each kind of network to various proxy technological learning indicators.

**Table 5.1b**

Overview of overall contribution of various networks to selected performance indicators

	New products/diversity	Upgrading products and quality	R & D	Growth in employment	Output and Sales	Employee training
Customer networks	****	****	**	***	****	**
Supplier networks	**	**	**	**	**	**
ESO networks	***	**	***	**	**	***
Firm-to Firm networks	**	**	*	*	**	*

**Key**

*****	Excellent
****	Good
***	Average
**	Poor
*	Very poor

The analysis of table 5.1b shows the following pattern:

- that customer networks mainly contribute towards upgrading of existing products, introduction of new products and improvement of product quality;
- supplier networks are important for minor improvements to products;
- enterprise support organisations are especially important for the design of new products, improvement of the production process and in some respects upgrading of existing products;
- firm-to-firm networks are useful for the diversification of product range, improvement of the production process and product quality.

These findings confirm the relative importance of customer networks in relation to other networks, but they also suggest that other networks take on added importance at different points in the development trajectory of a firm. Thus, while customer networks are important throughout, ESO networks appear to be important for those firms that are moving beyond process to product innovations.

Table 5.2 below provides further aggregation. It ranks the aggregated benefits that entrepreneurs or senior management of firms attach to different associations or linkages through a weighted index. It again shows that the most critical association identified by firms concerns customer linkages. This is followed by linkages with suppliers, larger firms and other firms respectively. Linkages with enterprise support organizations (ESOs) are perceived least in importance out of the 5 variables listed with their weighted index values reported in table 5.2. Thus, although Table 5.1b shows that ESOs can and do



contribute to different aspects of technological learning, Table 5.2 shows that their perceived overall importance is low. This corroborates the analysis in chapter 4, where it was argued that, although the potential impact is high, the relationship between SMEs and ESOs is on the whole quite weak. The importance of ESOs to SMEs is compromised by their relative absence in terms of provision of practical forms of assistance or inputs and the fact that only a small number of SMEs are actually able to access these services to any significant extent. The case study chapter 6, however, will show that in the most dynamic enterprises, ESOs can play a very significant role.

Although Table 5.2 also shows that linkages with other firms lag behind in importance when compared with those involving customers and suppliers, the aggregated index that is used hides some interesting data. Thus, approximately 24 percent of the enterprises regarded associations with large firms as important or very important and the aggregated index was pulled down by the 47% who regarded them as having little or no importance. The 47% figure illustrates the fact that many of the firms in the sample had little or no actual relation with large firms whereas the 24% figure shows that for the significant minority that do, the benefits are perceived highly. Within this latter category of SMEs are found business relations with large firms based on sub-contracting arrangements, in which SMEs manufacture intermediate goods for the use by large firms (see also chapter 6 where two of the four case study firms have arrangements with large firms). Largely because of lack of sufficient data

relating to particular survey firms, the extent of the associations is, however, not demonstrated adequately in table 5.2.

**Table 5.2: Basic comparison of importance of various linkages to firms<sup>1</sup>**

Type of Associations	Extent of benefits and Percentage(% of firms affected)			Total	Index	Rank
	Important/Very Important	Average Importance	Not/Slightly Important			
Customers	15.8	68.4	13.2	100	100	1
Suppliers	15.8	55.3	26.3	100	93.4	2
Linkages with Larger Firms	23.7	26.3	47.4	100	86.7	3
Linkages with other SMEs	7.9	55.3	34.2	100	85.4	4
Enterprise Support Organisations	15.8	28.9	52.6	100	79.9	5

The limitations of the structured survey data generated, noted with respect to Tables 5.1a, 5.1b and 5.2, also apply to the raw data that is the subject of statistical analysis during the remainder of this chapter. The findings below must, therefore, be subject to qualification although they provide some broad insights.

<sup>1</sup>Calculation of weighted index: Important/very important to respondent = 3; Average importance = 2; Not/slightly important = 1; thus for the highest weighted value, 'Customer Linkages' the calculation is as follows: (3 x 15.8) + (2 x 68.4) + 13.2 = 197.4. The score is rationalized to 100 because customer associations are the most beneficial overall. This is done by dividing 197.4

## **5.2 Statistical relationships between networking and technological learning**

As stated in the introduction, the important purpose of this chapter is to investigate the relationship between networking indicators and technological learning (TL) indicators through statistical analysis. Section 5.2.2 examines the relationship between the composite networking index and the TL composite index. Section 5.2.3 disaggregates these indices and cross-tabulates the different dimensions of networking with those of TL in terms of the statistical significance of the relationship through the Chi-square test. In section 5.2.4, the same disaggregation is done but this time examining the explanatory power and sensitivity of the relationships through regression analysis. Firstly, however, section 5.2.1 provides a note on the interpretation of the statistical relationships.

### **5.2.1 Caution when interpreting statistical relationships**

There are statistical criteria that have been established from both theoretical and empirical evidence to determine when a statistical relationship is said to be significant or not. However, statistical significance only indicates a significant association or correlation between two or more variables. It does not necessarily mean a strong causal relationship in the real life situation. The latter is determined in this study from theories of the firm as well as practical observations on how SMEs operate (see chapter 6). Thus the statistical

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by 1.974. The weighted scores of the other associations are then divided by 1.974 to complete the ranking.



relationships shown in this section may support the research hypothesis or they may qualify or refine it. They do not in themselves, however, prove or disprove the hypothesis.

The statistical significance criteria basically say that a sample measurement is statistically significant if the zero null hypothesis is rejected at 5%, or less, level of significance in hypothesis testing. The argument assumes that the null hypothesis states the no relationship argument while the alternative hypothesis stands for the existence of a valid statistical relationship as measured in the sample. The 5% level of significance measures the probability of rejecting a true null hypothesis, i.e., the chance of rejecting the no relationship argument. The smaller it is, that is, 5% or less, the higher the statistical validity of the sample data in support of the existence of a relationship. Thus, 5% is the general minimum level at which data is said to be statistically significant. Throughout this thesis tests of statistical significance are conducted at 5% or less level. A glossary of terminology used in the quantitative analysis is presented in the appendix (see Appendix E).

### **5.2.2 The aggregated networking and technological learning composites**

As part of the selection process of case study firms as well as for purposes of initially interrogating the relationship between networking and technological learning, all the 38 firms were positioned on a scattergram which plotted each firm's networking composite against its technological learning composite. These composites and their construction are explained in chapter 3, where the

networking composite combines the self-perceived (by each firm) quality of the following linkages: Enterprise Support Organisations (ESOs), Customer Linkages (CLs), Suppliers (SLs), and those with other firms (FFLs). The Technological Learning composite (the proxy for technological learning – see chapter 3) is made up of the following indicators:

- Production process adaptations over a specified period of time
- Level of involvement in research and development
- New products introduced over a specified period of time (including adaptation of existing products)
- Quality management systems
- Product quality, and
- Level of productivity.

The scatterplot (figure 5.1) presented in the following page shows the position of all the 38 firms of the sample (see data in Appendix A). The position of the four case study firms is distinctly marked on the scattergram, the technological learning composite (TLC) is the dependent variable while the networking quality composite (NQC) is the independent variable.

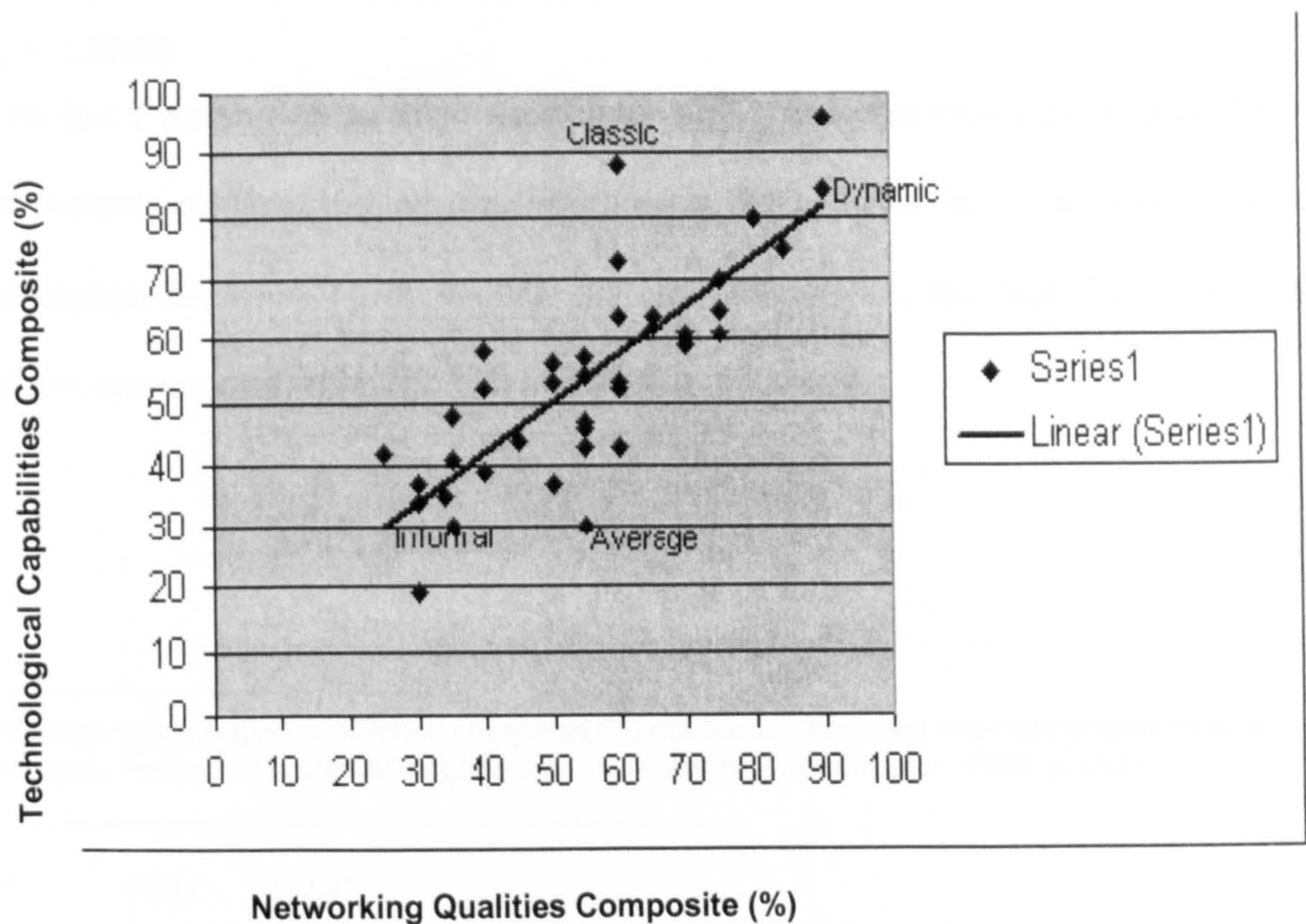
The method of selecting firms for case study analysis using the scatterplot and the rationale for doing so is also explained in chapter 3. In summary two firms that lie close to the trend line and hence appear to support the hypothesis, and two outlier firms that appear at least to qualify the hypothesis were chosen. These firms are marked on the scatterplot with their names and are the subject

of chapter 6 which gives a case by case analysis of them. Here I simply investigate the statistical correlation of the two composites.

The scatterplot shows a visually strong linear association between technological learning and networking qualities of firms. The positions of firms plotted on various points on the diagram show that there is a growth in TL which is associated with a rise in networking qualities. The existence of outliers observed on the scatterplot, however, shows that there are other factors that need to be considered carefully in the analysis of the relationship between TL and networking qualities.



**Figure 5.1 Scatterplot for survey firms (including four case study firms)**



To determine quantitatively the strength of the linear relationship depicted in the scatterplot, the statistical linear correlation coefficient is computed and presented below. Both the Pearson's correlation coefficient and the Spearman's rank correlation coefficients are used in cross validation of each other.

Pearson's correlation coefficient<sup>2</sup>

$$r = 0.8051$$

Spearman's rank correlation coefficient<sup>3</sup>

$$R_s = 0.8268$$

Both the *Pearson correlation coefficient* and the *Spearman's rank correlation coefficient* confirm the visual impression that there is a strong positive correlation between TL composite and NQ composite, ie., high TL composite values correspond with high NQ composite values.

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<sup>2</sup> Pearson's correlation coefficient computes the correlation between two ratio scaled random variables. Pearson's correlation coefficient ( $r$ ) is defined by (Wegner, 1993, p 312):

$$r = \frac{n \sum xy - \sum x \sum y^2}{\sqrt{[n \sum x^2 - (\sum x)^2] \times [\sum y^2 - (\sum y)^2]}}$$

Where  $r$  = the correlation coefficient  
 $X$  = the values of the independent variable  
 $Y$  = the values of the dependent variable  
 $n$  = the number of paired data points

The correlation coefficient is a proportion which takes on values only between  $-1$  and  $+1$ .

If  $r = +1$ : this implies *perfect positive* linear correlation.

If  $r = -1$ : this implies *perfect negative* linear correlation.

<sup>3</sup> *Spearman's rank correlation* is used to find a measure of association between two random variables if the data is *ordinal* scaled. This data is generated by such measurements as ranks, or positions in a sequence, or frequency of occurrence. Spearman's rank correlation is defined by (Wegner, 1993, p 316):

$$R_s = 1 - \frac{6 \times \sum d^2}{n(n^2 - 1)}$$

where  $n$  = number of paired ranks;  
 $d$  = difference in ranks.



In summary, enterprises with high technological learning tend to be associated with high networking qualities which supports the thesis hypothesis, although as stated above, cannot prove it.

A further examination of the scatterplot shows that there are some enterprises whose results qualify the general picture. For instance, there is need to explain why some firms have relatively high technological learning yet relatively low networking qualities. There are also some firms which show high networking qualities yet relatively low technological learning. Two of these other firms have been included in the case study analysis. At this stage what can be said about the above observation is that there are other factors influencing the technological learning qualities of firms which the statistical analysis on its own is unable to unearth.

The next sub-section uses Bivariate Chi-Square and Regression Analyses to assess further, in a disaggregated fashion, the relationship between the technological learning indicators and networking qualities as estimated by the various linkages.

### **5.2.3 Disaggregated analysis of networking and technological learning relationships (1) the bivariate Chi-square analysis**

The Chi-Square Analysis is introduced in chapter 3, and elaborated upon in appendices. Essentially it demonstrates the significance of the association between variables. The summary analysis for the disaggregated variables that make up the networking and technological learning composites (plus two extra



variables in the latter column – staff commitment to quality and employee training) is shown in table 5.3a.

Table 5.3a shows that the large majority of relationships tested are significant at the 5% level. The majority of those involving customer linkages are also significant at the more stringent 1% level, while three involving firm-to-firm linkages are insignificant at the 5% level.

**Table 5.3.a Chi-Square Analysis Summary**

<b>Dependent Variables (TL indicators)</b>	<b>Independent/Explanatory Variables (Networking Indicators)</b>			
	<b>Enterprise Support Linkages (ESL)</b>	<b>Customer Linkages (CL)</b>	<b>Supplier Linkages (SL)</b>	<b>Firm to Firm Linkages (FFL)</b>
<b>New Products (NP)</b>	0.037	0.008	0.039	0.043
<b>Quality Management System (QMS)</b>	0.004	0.000	0.000	0.026
<b>Staff Commitment to Quality (SCQ)</b>	0.050	0.018	0.06 (insig.)	0.08 (insig.)
<b>Product Quality (PQ)</b>	0.004	0.000	0.000	0.001
<b>Research and Development (R &amp; D)</b>	0.016	0.001	0.012	0.002
<b>Production Process Adaptations (PPA)</b>	0.049	0.021	0.013	0.07 (insig.)
<b>Productivity (P)</b>	0.049	0.000	0.012	0.10 (insig.)
<b>Employee Training (ET)</b>	0.008	0.001	0.022	0.035

**Note**  
Figures show the level of significance where all values equal to or less than 0.05 indicate statistical significance of relationship at 5% level or less. Values equal to or less than 0.01 indicate statistical significance at the more rigorous 1% level. The insignificant (at the 5% level) relationships are highlighted by addition of (insig.)

Table 5.3b ranks the technological learning variables in relation to each networking variable according to their Chi-square levels of significance as tabulated in Table 5.3a. The ranking shows that overall, Product Quality, followed by Quality Management Systems are the most strongly correlated with the networking indicators. Surprisingly, the third quality indicator -- staff commitment to quality (SCQ) -- appears to have the weakest correlations overall with networking indicators. One, albeit speculative, explanation for this anomaly, is the lack of appreciation by firms of the role of staff with respect to quality issues.

**Table 5.3 b Chi-Square Analysis (Rankings)**

	<b>Independent/Explanatory Variables (Networking Indicators)</b>			
<b>Dependent Variables (TL indicators)</b>	<b>ESL</b>	<b>CL</b>	<b>SL</b>	<b>FFL</b>
NP	5	6	7	5
QMS	1	1	1	3
SCQ	8	7	8	7
PQ	1	1	1	1
R & D	4	4	3	2
MPA	6	8	5	6
P	6	1	3	8
ET	3	4	6	4



The above Chi-square analysis summary tends to confirm at the disaggregated level scatterplot results shown in the previous section because, with few exceptions, there is a significant relationship between the networking and technological learning variables. However, it does also suggest that some of the disaggregated variables may be more significant than others. Thus, Table 5.3a shows that customer linkages are the most strongly correlated with the different indicators of TL all-round, and firm-to-firm linkages are the least strongly correlated. Even at the 1% level, only 2 of customer linkage-technological learning correlations are insignificant, compared to 5 or 6 for the others. Within the specific context of the SME sector in the country, this seems logical. Because of their size and level of sophistication, the most developed linkages SMEs have are with customers. Customers have the greatest potential to make or break the enterprises and hence the high value and emphasis placed on those associations by the firms in enterprise development. Similarly the association that evolves between entrepreneurs and customers is critical to the mutual gains derived by each party. For example, through close interactions with the firms, some customers are able to make their demands and specifications clear as well as obtain some bargains which are not offered to the general public. Enterprises benefit by securing a regular guaranteed market for their products with potential to grow as trust and confidence is built with more customers and potential ones. Of special relevance to this thesis, good networks with customers also provide a source of ideas for variations, new products or producing them to higher quality (i.e., ideas for innovation).

With respect to other associations shown in Table 5.3a, many SMEs simply require good basic supplier linkages in order to guarantee them raw materials

although as they grow and the level of sophistication increases, better supplier linkages may be required. With respect to Enterprise Support Linkages, large numbers of SMEs do not use their services anyway although the services are perceived to be important. The weak relationship between most SMEs and enterprise support services has the effect of scaling down the effect that these linkages have on learning within the enterprises as measured by various indicators. The apparent relatively weak relationship between firm-to-firm with technological learning variables may be because of the inability of the quantitative data to capture a variety of informal and largely invisible connections that go on between enterprises. There is also the argument that these linkages may not be strong because other firms are regarded as competitors and cooperative relations do not materialize because of mutual suspicion (i.e., lack of trust). This may explain why in Chi-Square analysis, three of the firm-to-firm linkages are insignificant. The case study analysis (chapter 6) investigates the linkages between firms in more detail. The analysis in that chapter will be seen to reinforce the statistical test results presented in this section.

Despite the limitation of the proxy variables used to capture technological learning and networking (see also chapter 3, *pp 77 – 81*), the analysis so far at least indicates the probability of important associations (without which statistical analysis would be of little value).



#### **5.2.4 Disaggregated analysis of networking and technological learning**

##### **relationships (2): The simple linear regression results**

Whereas Chi-Square analysis indicates the significance of a relationship, regression analysis indicates the explanatory power and sensitivity of the variables in their relationship to each other. Thus, if a relatively small change in the independent variable is associated with a relatively large change in the dependent variable, this indicates a high level of sensitivity in relationship. Conversely, if a relatively large change in the independent variable is associated only with a relatively small change in dependent variable, this indicates a low level of sensitivity in the relationship.

The first step in the regression analysis is to check whether the independent variables (the different networking linkages) are linearly related with each other. Statistically strong correlations between independent variables in a multiple regression model generate a problem technically referred to as *multicollinearity*. Strong multicollinearity is undesirable because it makes multiple regression coefficients insignificant, sometimes carrying wrong or reversed signs combined with an inflated model explanatory power as measured by R-squared, the multiple coefficient of determination. In short, multicollinearity distorts multiple regression model results.



Table 5.4 is a correlation matrix (using the Pearson correlation coefficient – see section 5.2.2) for the independent (networking) variables of this study. The matrix generally shows high correlation coefficients among the 4 key variables listed and therefore multicollinearity.

**Table 5.4 Correlation Matrix: Various Linkages as a Test of “Multicollinearity”**

		Current quality of customer linkages	Current quality of technological linkages	Current quality of supplier linkages	Current quality of linkages with other firms
Current quality of customer linkages	Pearson Correlation	1.000	0.621	0.809	0.603
	Significance	0.000	0.000	0.000	0.000
Current quality of technological linkages	Pearson Correlation	0.621	1.000	0.631	0.511
	Significance	0.000	0.000	0.000	0.000
Current quality of supplier linkages	Pearson Correlation	0.809	0.631	1.000	0.566
	Significance	0.000	0.000	0.000	0.000
Current quality of linkages with other firms	Pearson Correlation	0.603	0.511	0.566	1.000
	Significance	0.000	0.000	0.000	0.000

All correlations are significant at the 0% level, i.e., correlations are 100% valid. Sample size is 38.



Correlations matrix is symmetrical, i.e., correlations below main diagonal of correlations matrix are the mirror-image of the correlations above the main diagonal.



One way out once this problem has been identified, as is the case in the networking variables correlation matrix in table 5.4, is to run simple regression models with one explanatory variable at a time and this is the approach adopted in this work. Before we move on to do this, however, the fact of high multicollinearity among the networking variables suggests an important point for this thesis. It is that, although the different networks are interrelated, earlier discussion indicates that different networks may be important at different times in the evolution of the firm and one needs to view the package as something that is applied dynamically over time.

Statistical test results run in simple linear regression models are presented in table 5.5. The major independent and dependent variables used in the linear regression analysis were respectively the networking and technological learning variables that made up the networking and technological learning composites (with addition of staff commitment to quality and employee training for TL), as in the Chi-Square Analysis.

Results with respect to the dependent variables shown in table 5.5 satisfied the statistical significance test at 5% level of significance in both the estimated coefficients (using the t-test) and the explanatory power of the models using the F-test (see appendix for explanation of these tests).

The coefficient of determination (R-squared)<sup>4</sup> was used to evaluate the model results. This coefficient measures the extent to which the variation in the dependent variable is explained by the variation in the independent variable(s); i.e., it measures the explanatory power of a regression model. According to the Adjusted R-square results, the strongest explanatory model covers the three quality variables of technological learning, the two process variables (Production process adaptation and productivity) and research and development with Adjusted R-square ranging between 0.80 – 0.96 across these. The weakest model relates to employee training (ET) and new products (NP) which have Adjusted R-square ranging from 0.61 to 0.72.

Turning to the relative R-Square rankings of the networking variables, it is clear that customer linkages have the highest explanatory power across the range of eight technological learning variables (six, 1 rankings and two, 2 rankings).

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<sup>4</sup> Coefficient of determination

$$R^2 = 1 - \frac{\sum e_i^2}{\sum y_i^2}$$

Where  $\sum e_i^2 = \sum (Y_i - \hat{Y}_i)^2$  is random or unexplained variation in the regression model.

$\sum y_i^2 = \sum (Y_i - \bar{Y})^2$  is total variation in the dependent variable Y.

$\frac{\sum e_i^2}{\sum y_i^2}$  measures the proportion of unexplained variation in Y (Koutsoyiannis, A (1977)).



Enterprise support and firm to firm linkages generally show the lowest explanatory power.

The relatively low ranking of enterprise support linkages (ESL) for each of the dependent TL variables in table 5.5 is not necessarily suggesting that ESL as defined are less important than the other kind of linkages. What is argued here is that there is more that needs to be done with respect to ESL than is the case with other kinds of linkages, for example, facilitating stronger networks by initiating programmes in that direction as has been the case in other countries (for example, Latin America, Europe, South East Asia, etc.,) where special programmes have actually been implemented to foster innovation and networking for enterprises.

**Table 5.5**      **Summary of simple linear regression results with respect to selected main indicators**

	<b>Adjusted R-Square and R-Square ranking (in brackets) for Independent/Explanatory Variables (Networking Indicators)*</b>				
<b>Dependent Variables</b>	<b>ESL</b>	<b>CL</b>	<b>SL</b>	<b>FFL</b>	<b>Comment on Adjusted R-Square</b>
NP	0.61 (4)	0.72 (1)	0.71 (2)	0.69 (3)	Relatively Low
QMS	0.86 (3)	0.92 (2)	0.93 (1)	0.85 (4)	Relatively High
SCQ	0.85 (4)	0.93 (1)	0.88 (2)	0.88 (2)	Relatively High
PQ	0.86 (4)	0.96 (1)	0.94 (2)	0.93 (3)	Relatively High
R & D	0.84 (3)	0.86 (2)	0.83 (4)	0.89 (1)	Relatively High
PPA	0.82 (2)	0.84 (1)	0.84 (1)	0.80 (4)	Relatively High
P	0.86 (3)	0.92 (1)	0.88 (2)	0.83 (4)	Relatively High
ET	0.63 (2)	0.66 (1)	0.63 (2)	0.61 (4)	Relatively Low

**Note:**

Dependent variables = Technological learning indicators (1, 2, 3, 4 = row-wise ranked with respect to Adjusted R-square); where 1 = strongest Adjusted R-square and 4 is weakest Adjusted R-square).

Table 5.6 shows the 'elasticity' of the different networking and technological learning relationships. Elasticity is a measure of the sensitivity of the relationship. The elasticity results show that the technological learning indicators respond to each of the linkages within the range 0.69 – 0.98. This implies that a 100% change in each of the linkages leads to 69% – 98% change in the technological learning indicators defined. Within this elasticity range, of the networking variables, customer linkages are the most sensitive (elasticity range across the TL variables 0.75 to 0.98) and enterprise support linkages (elasticity range across the TL variables 0.69 to 0.93) the least sensitive. Of the technological learning variables, process indicators such as Quality Management Systems, Product Quality, Production Process Adaptations, Productivity and Staff Commitment to Quality are the most sensitive (elasticities range from 0.84 to 0.98 across the networking variables) and Research and Development is the least sensitive (elasticity ranges from 0.69 to 0.75 across the networking variables).



**Table 5.6 Summary Simple Linear Regression Results**

	Independent Variables			
Dependent Variables	Enterprise Support Linkages (ESL)	Customer Linkages (CL)	Supplier Linkages (SL)	Firm-to firm Linkages (FFL)
<b>NP</b>				
Coefficient	0.653	0.601	0.652	0.669
Elasticity	0.74	0.88	0.84	0.84
<b>QMS</b>				
Coefficient	0.961	0.823	0.921	0.902
Elasticity	0.89	0.98	0.98	0.93
<b>SCQ</b>				
Coefficient	1.172	1.011	1.099	1.126
Elasticity	0.84	0.94	0.91	0.90
<b>PQ</b>				
Coefficient	1.175	1.048	1.152	1.195
Elasticity	0.93	0.96	0.94	0.85
<b>R &amp; D</b>				
Coefficient	0.930	0.774	0.854	0.902
Elasticity	0.69	0.75	0.73	0.75
<b>PPA</b>				
Coefficient	0.742	0.618	0.695	0.692
Elasticity	0.90	0.97	0.97	0.94
<b>P</b>				
Coefficient	1.023	0.876	0.954	0.951
Elasticity	0.88	0.97	0.94	0.91
<b>ET</b>				
Coefficient	0.984	0.833	0.914	0.923
Elasticity	0.81	0.89	0.87	0.85

**Note 1:** The regression coefficient estimates how much the dependent variable changes for each unit change in the independent variable and it is the gradient of the estimated regression line.

**Note 2:** The simple linear relationships are all significant at the 0% level using the t-test on each coefficient, i.e., they are highly statistically significant.

Note 3:

Elasticity	$= \frac{dY/Y}{dX/X}$	$= \frac{dY}{dX} \times \frac{X}{Y}$
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This means that elasticity measures the relative marginal change in the dependent variable in relation to a relative marginal change in the independent variable.

The elasticity formula above when finally rearranged represents the linear regression coefficient or gradient adjusted by a normalizing factor of  $X/Y$  to allow comparison across the relationships to be made since the generated elasticity measure has no units.

To avoid generating a whole series of elasticities, linear regression functions can be analyzed by considering the average elasticity which will be a single value generated by the following formula.

Mean Elasticity	$= \frac{dY}{dX}$	$\times$	$\frac{\overline{X}}{\overline{Y}}$	$—$
	$=$ Estimated Coefficient	$\times$	$\frac{\text{Mean Independent Variable}}{\text{Mean Dependent Variable}}$	

- Elasticity = 1 : unit elasticity, means a percentage change in the independent variable results in an equal percentage change in the dependent variable.
- Elasticity < 1 : inelastic, means a percentage change in the independent variable results in a proportionately smaller percentage change in the dependent variable.
- Elasticity > 1 : elastic, means a percentage change in the independent variable results in a proportionately larger percentage change in the dependent variable.
- 

The regression model results demonstrate a number of important points which are made in this thesis. Firstly, firms operate in a business environment whereby they have the potential to engage in a variety of networks. But the degree to which firms do engage in a particular network is variable. This depends on the capacities and priorities of the firms, among other factors. For example, enterprise support linkages and firm-to-firm linkages in general, show a relatively weak relationship to indicators of technological learning in the

regression results in comparison to the other linkages. This observation may be explained by the inward looking tendencies of Zimbabwean firms, which is well documented (Zimconsult, 1999; CIED, 1996). There is also another important point, which is that qualitative data with respect to the importance of informal networks to small firms is not factored in the regression equations. The result of this is to under-value firm-to-firm linkages as well as other kind of networks which are based on informal relationships.

### **5.3 Concluding remarks**

The statistical findings in this chapter broadly support the study hypothesis. The disaggregated analysis, however, extends our understanding considerably. Three general points can be made.

Firstly, the high multicollinearity between the four networking variables of the study suggests that a package of the linkages may be important. However, the elements of the package are not necessarily equally important at any given moment in time. Thus, the importance of specific linkages will vary depending on the circumstances of the enterprise, its needs and priorities at a particular point and time.

Secondly, from the presentation of the Chi-square and linear regression results, it can be concluded that the four key types of networks specified, namely, enterprise support, supplier, customer and firm-to-firm linkages are all associated with technological learning. Within this broad support for the study hypothesis, customer linkages (CL) consistently have the strongest and most sensitive relationship, firm-to-firm linkages (FFL) and enterprise support linkages (ESL) the



weakest and least sensitive. The relative weakness of enterprise support linkages has been discussed already in chapter 4, and the findings here corroborate the argument of that chapter. The relative weakness of firm-to-firm linkages is possibly explained by mutual suspicion and lack of trust of these firms for each other.

Thirdly, of the technological learning indicators, those associated with improving quality and other process improvements seem overall to have the most significant and sensitive relationship with the networking variables. This possibly demonstrates the analysis of Forbes and Wield (2002, pp 85 – 108, also see chapter 2, section 2.2.2) and that the majority of light engineering SMEs in Zimbabwe are currently at the process improvement stage of their innovation capabilities. The stage beyond this concerns product improvement.

These conclusions can be stated with a reasonable degree of confidence because of the mutually reinforcing nature of the different kinds of analysis conducted in this chapter. However, in drawing these conclusions, the difficulties associated with the primary data, and of the proxies that have been developed for technological learning and networks, act as an important qualifier on them. What the conclusions do suggest are important areas for deeper investigation.

Thus the above conclusions suggest areas to be explored more deeply in the case study analysis that follows. Chapter 6, therefore, provides further insights into the dynamics of networking relations that involve Zimbabwean light engineering SMEs.

## **CHAPTER 6: CASE STUDY ANALYSIS**

### **6.0 Overview**

This chapter is based on four firms that are investigated using the case study approach. The structured survey results presented in the previous chapter to a large extent determined the firms selected for case study analysis. The scatterplot which is presented in the previous chapter shows the relative position of each of the firms in the sample survey. As shown in chapter 5, the strong linear correlation coefficient of the scatterplot highlighting a positive relationship between networking and technological learning provides a useful basis for case study analysis. As stated in previous chapters, two best fit firms (which tend to support the hypothesis) and two outlier firms (which tend to deviate from the hypothesis) were selected for the case studies. The four firms have characteristics that differentiate them from each other while at the same time providing an insight about the firms in relation to the issues under investigation. The names of the firms and interviewees are pseudonyms.

## 6.1 A Case Study of Dynamic Engineering

***Classification:*** High level networker with corresponding high technological learning characteristics; A very dynamic enterprise in terms of level of technological learning with equally high networking qualities.

### Background

Dynamic Engineering started operating in 1995 as an informal enterprise with a start up capital equivalent to about US\$400, which in local currency terms was a significant amount at the time. Mr Dyna, the owner, who in March 2000 when aged 36, successfully underwent a formal apprenticeship diploma course with Willowvale Mazda Motor Industries (WMMI) between 1987 – 1991. WMMI is part of a local state owned conglomerate, Industrial Development Corporation (IDC). The training programme involved hands on fitting and turning practical work as well as theoretical courses at the Harare Polytechnic College. This resulted in Dyna obtaining a Class 1 fitter and turner diploma certificate. Soon after completing the fitting and turning training course in 1991, Dyna was engaged by WMMI as a newly trained fitter and turner. He worked full-time at WMMI for 7 years until 1998.

Three years earlier, while still employed, Dyna had started his informal small scale metal fabrication enterprise. While a student at Harare Polytechnic and as an apprentice at WMMI, Dyna designed door handle plates and nose



brackets as part of his student project which became the basis of this enterprise. The products were later modified and fine-tuned with more products being introduced over the years as the business became established. With assistance from two inexperienced young men, Dyna operated the micro-enterprise on a part-time basis for 2 years until 1997 when he formally registered Dynamic with the Registrar of Companies.

### **Organisational structure and human resources situation**

In 1995 the company employed 2 part-time workers, increasing the number to 3 in 1997 at which point all the workers were engaged on a full-time basis. By the end of 1997 the company had 4 workers, rising to 12 in 1999. By year 2000 the company had engaged 14 full-time employees. However, due to an unfavourable and unstable macro-economic environment, business had not grown as was anticipated resulting in decline of production and revenue. The company had to revisit the status of its workforce and its expansion plans. By mid-February 2001 only 9 employees were employed by Dynamic while 5 posts left vacant over the past several months had been made redundant.

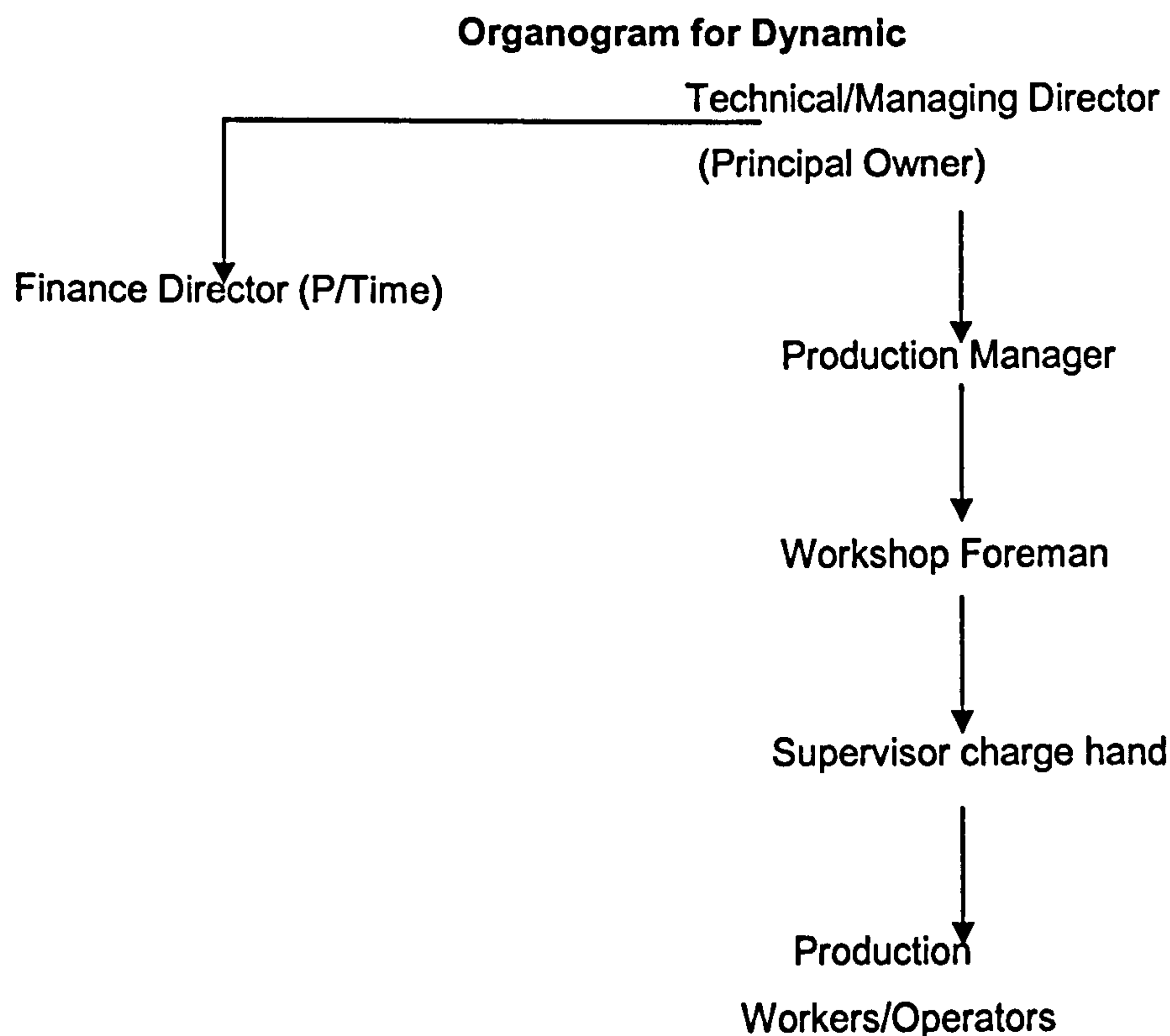
The owner's official designation is that of Technical Director. Cindy, the wife of the owner, who works part-time, has an official designation of Finance Director. Shadreck, a young brother of Dyna (26 years old), is one of the full-time employees of the firm. Dyna is informally passing on his fitting and turning skills to his brother. Shadreck has over a few years grown to be technically competent from the in-house training obtained within the firm. After less than 5 years of technical exposure and on-the-job training, he is capable of operating all the machinery within the company. At the time of

the interviews Shadreck was the Production Manager, assisting the owner with managerial duties in the factory.

Dyna places a great deal of trust in Shadreck, who is second in command to him in the firm's operations and also plays a key role in the production team. Dyna's wife Cindy, is a co-director but not involved in day-to-day activities of the firm. Cindy keeps a close track of business affairs, providing important financial management and accounting inputs. However, full accounts for the enterprise are done by an independent consultant hired on a regular basis.

The most senior person in the firm in terms of age and working experience is the workshop foreman known within the firm as 'the old man' with 25 years previous foundry experience at Rio Tinto Industries, a multinational conglomerate that operates in Zimbabwe. He acts as a supervisor in the factory and is also involved in technical mentoring of junior staff besides his production process responsibilities. In terms of operations, the core team comprises the owner, the production manager and the workshop foreman. The owner plays a major role in guiding the team in technical matters as well as in general management issues. The commanding presence of the owner gives a high motivation to the team to produce a high quality output. The owner is emphatic on meeting production targets, both in terms of quality and quantity. As a result the products made have within a fairly short period gained increasing confidence in the market.

The firm's structure is described by the following organogram.



Despite its small size, Dynamic is a fairly well structured organisation as can be observed from the above organogram. The owner plays a key role in the day-to-day management of the enterprise, supported by a small number of technical personnel.

### **Range of products manufactured and their growth over time**

The firm produces a range of products where the focus is on the production of small items with considerable value addition. The following is an indication of growth in product range over time which demonstrates a certain degree of technological accumulation within the firm over the stated period:-



**Table 6.1: Products produced by Dynamic over time**

<i>Year</i>	<i>Products</i>	<i>Contribution to revenue</i>
1995	Handle plates Square nose brackets Round nose brackets	25% 50% 25%
1996	<b>Added:</b> peg stay pins peg stay rests; peg stay holders	Not available
1997	<b>Added:</b> Window frame hinges while maintaining existing product range	Not available
1998	<b>Added:</b> French door hinges and butt hinges, while maintaining production of existing products	Not available
1999	<b>Added:</b> Window handles, peg stays, sliding stays and mild steel products	30%

*Note: no products were removed; many new changes have since been made to existing products in terms of material used and overall quality of items.*

The above Table demonstrates that, in the 5 years up to 1999, the company experienced some growth in range of products that it produces. Although the firm has achieved a breakthrough in the manufacture of a good range of products within a short space of time, plans are in place to produce an increased number of products. By the first quarter of year 2000, the company had plans to introduce at least two new products to add to those that were already under production. Research and development efforts for the manufacture of intermediate products used in the production of furniture products were at an advanced stage. Furniture accessories such as cupboard and wardrobe handles were to be introduced, initially targeting a small number of customers in Harare. Dynamic had already designed the

moulds for the production of the items. The main target market which includes local furniture shops and retail shops had also been sensitised. The firm had managed to receive some positive signals from potential customers through informal communication.

### **Production capability**

The firm is technologically dynamic and plays an active role in technological aspects of investment in production facilities in use. The firm has generated a significant part of its technology which incorporates design of a unique range of capital goods in-house. Dynamic is well endowed with technical expertise for its production processes with the owner playing a key role in the factory. Almost all of the production staff employed by Dynamic during 1999/2001 are semi-skilled, having mastered their production skills on the job. The personnel have good technical know-how as demonstrated by the good quality of products produced by the firm. The company boasts a variety of production machinery which is mostly acquired through local auction sales. Most of the machinery and equipment were rejects acquired in non working order but then overhauled, repaired and made to work in-house by the firm's technical personnel, led by the owner.

At the time of the investigation the firm had managed to acquire at least 6 pieces of equipment which include an eccentric press, a threading machine, a bending machine, a drilling machine and some polishing machines. Most of these machines and equipment did not work at the time they were acquired. However, within a short space of time technical work was initiated on them resulting in them being put to good working order. Examples of

some of the major pieces of equipment and machinery available to Dynamic are given below.

The eccentric press referred to above was acquired from an auction sale for about US\$270 and had been hardly used but was technically faulty at the time it was obtained. The market price of a new press is approximately US\$3 270 - about 12 times the price of the press obtained from the auction.

The threading machine also acquired through an auction sale has since been repaired by the company's technical personnel to good working order.

The bending machine obtained by the enterprise in a similar manner has also enabled the firm to make considerable savings because of its utility in the production process.

Turning to other pieces of machinery and equipment, an abrasive cutter was manufactured in-house using scrap material. The motor attached to the cutter was sourced externally. The abrasive cutter cost the firm about US\$55. A new abrasive cutter of the same capacity and performing the same function costs approximately four times as much on the local market. A fly press, another major piece of machinery which the firm has access to has been on hire from the nearby Intermediate Technology Business Service Centre for a fee of less than US\$2 per working day since 1998. At the time discussions were made with the owner, the firm had no plans to acquire its own fly press. Plans were, however, in place to acquire more equipment and machinery to improve the production process and introduce new products within the coming years. It is noted that the firm's ability to modify in-house second-hand essential equipment and machinery to suit its



situational needs, while also being able to master technology manufactured elsewhere, demonstrates a high level of technical expertise.

### **Employee training**

The firm has a strong in-house staff technical skills upgrading programme. The programme is both planned and ad hoc. Workers are encouraged to participate in training which is managed externally by local vocational and technical colleges. The company has in the past paid for some of the training done by at least three of its personnel. For example, during 1999 an equivalent of approximately US\$500 was spent on trainers' fees and associated expenses involving the training of 5 of the firm's workers. This compares favourably with the zero expenditure by many other SMEs in related and associated activities. Indeed many of the firms studied indicated that they have not incurred any expenditure at all on employee training over the entire period covered by the research.

Plans are in place to invest more resources to improve technical expertise through in-house skills upgrading and training, both formal and informal. The firm values on-the job training of its factory personnel, which is a lower cost option than sending personnel for external training over a long period. There is a considerable level of technical mentoring that goes on in the firm with experienced staff passing on their skills to inexperienced personnel. The Workshop Foreman is a good source of knowledge and inspiration to the firm and is considerably involved in the on-going skills development of the other workers. The firm also draws on the expertise of an externally hired human resources consultant who assists in building organisational skills of staff on an on-going basis.

Good technical training acquired in-house and externally has enabled the firm to become technically equipped in modifying its tools, equipment, machinery and production processes which have improved significantly since start-up. Areas of technical expertise for which new knowledge was acquired in recent years include production processes of a number of new products which later proved to be a market success.

### **Quality management**

Every factory worker is in one way or another involved in quality management to a varying degree. The owner and the production manager who exercise a high level of control on matters related to quality have primary responsibility on quality management. The Workshop Foreman is also a major player in quality management with a particular responsibility in polishing and finishing products to give them a refined quality finish.

The firm stresses the need for quality awareness and continuous improvement. The analysis of the factory and the manner in which staff execute their responsibilities shows that production staff are largely committed to issues related to quality management. Product quality is reported by management to have improved considerably over the three year period up to 2001. During the same period the enterprise experienced significant growth in the volume of its marketed products.

### **Firm's involvement in research and development (R & D)**

Management within the firm perceives that the company's involvement in research and development is quite good in relation to other firms. The company is among a few SMEs studied which could be said to have

invested substantially in research and development over time. However, accurate data on the firm's financial commitment to R & D over specific periods are not forthcoming. The commitment is largely in terms of personnel (though not on a full-time basis) and not in terms of direct financial expenditures. Direct expenditures seem quite modest with an estimated equivalent of US\$240 spent on some form of R & D activities between 1997 - 1999.

### **Level of productivity**

The firm has a high self-perception of its productivity over the past two years, having shifted from an average to a more competitive status from previous years. Despite being a relatively young firm, the enterprise regards itself quite favourably relative to its competitors in terms of productivity, placing itself in the top quartile of small to medium sized firms operating within the same sector. This status was attained within a period of 5 years, having started from a fairly basic operational position.

## **ANALYSIS OF NETWORKS**

### **Customer networks**

Dynamic is well connected with a variety of customers, in particular institutional ones which include other SMEs engaged in metal fabrication goods like door frames, window frames and other items sold to the construction industry. Construction firms in their own right also constitute a sizeable customer base for Dynamic in recent years, accounting for an estimated 20% of the business generated. There are specific companies that buy goods from Dynamic on a regular basis. The enterprise is



especially keen to forge stronger linkages with institutional customers with a view to increasing its volume of business and profitability.

Good customer linkages have been forged with at least 3 medium sized retail and hardware shops located in Harare. The shops regularly order a variety of items from Dynamic which they stock in their premises for sale to customers. In this way Dynamic has managed to expand its customer base considerably. A variety of institutional and individual customers are generated in the two major cities of the country, Harare and Bulawayo, as well as in other smaller centres like Kwekwe. The customer base seemed to be growing as at the end of 2000.

Dynamic's marketing strategy involves the following:

- Targeting companies - mainly small to medium sized ones which constitute a major source of business. This also includes retail and hardware shops and construction firms which are mainly urban based. Institutional customers constituted more than 50% of Dynamic business by the end of year 2000.
- Other SMEs (both formal and informal) coming directly to buy products at the factory (volume of business generated by other SMEs is variable but can rise up to 30%). Small metal processing workshops are especially useful because they help Dynamic to boost its cash-flow, especially with variable large orders which tend to be quite unpredictable.
- Individual customers (about 10% of sales volume).

- Export market (largely those in neighbouring countries obtained through personal contact). The export market, however, seems not to have been well established at the time of the last visits to the firm at the end of 2001.

The firm's customer relations are good, paying particular attention at meeting specific customer requirements. At least once a month, and as often as possible, the owner visits the firm's regular customers especially the larger institutional ones. Through these regular visits, the enterprise is able to formulate new production targets relating to the type and quality of products required by customers. The main collaborative activities undertaken by Dynamic and customers are in the form of exchange of ideas and suggestions to improve the product quality which covers production of consistent items acceptable to a larger number of customers. For example, some of the hardware and building material shops challenged Dynamic to produce more competitive products (for example, handle plates, peg stays, window frame and door hinges) in terms of price and quality than those offered by the firm's competitors. Dynamic is able to source intelligence information about the products of competitors from some customers by demonstrating capacity to manufacture products with a different quality touch. Outreach to customers normally begins with the production of a sample of products which is shown around to a variety of potential customers. Guaranteed orders are then secured from interested customers. Many of the customers make repeat orders, sometimes increasing considerably the quantities of their purchases from the firm depending on

their needs. This especially relates to regular customers who deal in relatively large volumes of products.

By the first quarter of 2000, the firm had begun to make some inroads into the export market. The export customers made their specifications on product requirements known to Dynamic through visits to the firm which were initially exploratory. Some quality assessments were made jointly with Dynamic through physical checks. Potential export buyers compared products on offer with those available elsewhere. They provided positive feedback with respect to the competitiveness of the firm's products. Subsequently, a steady flow of orders was processed. Although small quantities of products have been handled initially, the firm has had a good start to exporting its products to date. This is the case despite the poor macro-economic environment which has not been favourable to most of the country's exploratory businesses.

During the early days of product design, the enterprise had little or minimal contact with potential customers. However, later as the firm sought to implement its product improvement and development plans for a defined market, Dynamic actively and directly sought customer feedback with a view to producing products with a high market acceptance. For example, improvements on handle plates, peg stays, round and square nose brackets and a few other products made by the firm over a period of 4 years are based on customer feedback generated through good networking and contacts with buyers and potential ones.

Product pricing and timeliness of delivery are some of the other important issues pointed out to Dynamic by a number of customers to enable the firm



to become competitive. Similarly, successful production and marketing of brass window handles, one of the successful products made by the firm, is as a result of close linkages with customers, both individual and institutional buyers. Information on product quality and specifications is obtained by the enterprise from certain potential customers on a regular basis in the product development process. The firm also buys small samples of products manufactured by certain competitors from hardware and building material shops in Harare. The products are examined with a view to copying and modifying the designs. Where it is appropriate, product designs are modified within the firm to meet the needs of customers. These initiatives are perceived by Dynamic to have contributed to the manufacture of improved and better quality products.

From the foregoing analysis, it seems evident that networks with customers are of strategic importance to Dynamic, especially with respect to generation of market information about quality, products, competitors and potential customers. The owner of the firm plays a leading role in this area, gathering a considerable amount of market information through informal contacts within various firms and personally through non-formal visits to particular firms. From time to time the owner makes unofficial visits to potential institutional customers, in particular those located in Harare with a view to securing business orders. Successful informal contacts usually result in some formal arrangements being made whereby business deals are secured with specific quantities of items ordered and supplied to particular customers.

Quite often, however, contacts with potential customers do not always lead to orders being secured but contribute to a deeper understanding of the customers' needs. This assists the enterprise to position itself better relative to competitors as well as to meet the needs of both existing and new customers. In some cases, this results in securing important customer feedback which assists the firms in product development and modifications required to suit specific customer needs. The fine-tuning and changes made to products such as handle plates, square nose brackets, round nose brackets and many others of the firm's products which have grown to be a market success story is largely a result of close contacts with both individual and institutional customers.

On the whole, therefore, customer networks do play an important role in this case, firstly in collaborative identification of market needs and secondly in the provision of information on specific requirements. Customer networks in this case facilitate the exposure of what needs to be done to improve existing products in terms of quality and other important characteristics.

### **Supplier networks**

Dynamic is well linked to a wide range of suppliers of a variety of raw materials in Harare where the company is based. Many of the linkages have evolved to become networks over time. The firm is keen to increase its volume of manufactured output by strengthening its supply of raw materials, among other strategies adopted. It holds accounts with several local companies supplying raw materials and inputs used in metal processing. Good supplier linkages have been forged with lines of credit for the supply of raw materials opened up with five Harare based supplier firms between the

period 1999 and 2002. The credit facility often operates on 30-day credit basis and is subject to review from time to time. The credit limit of the value of raw materials the firm can acquire at any given time varies from US\$200 up to US\$910. Because the supplier credit is managed well with agreed payments done on time, several of the suppliers are keen to expand the credit facilities to allow Dynamic to secure larger quantities of materials.

The enterprise has a good track record of sourcing raw materials from a growing number of suppliers with relationships having grown over a period of more than 6 years. Confidence and trust have been built with the suppliers. Besides having access to the 30-day credit facilities for the supply of raw materials, Dynamic also sources smaller quantities of raw materials on a cash basis from these and other suppliers located within Harare. The enterprise obtains most of its raw material requirements through supplier credit and does not need to resort to other expensive options like commercial bank overdrafts.

Supplier networks assist to build up the necessary inputs required to produce certain new and existing products. Information on specific raw materials and their use, together with the timely supplies of raw materials in sufficient quantities enables the firm to embark on new product development and innovations with minimum bottlenecks. This is innovation and learning enhancing in that when the supply of inputs is guaranteed and firms are knowledgeable about how to use the materials, they are better able to plan and explore new opportunities, including developing new products. On the contrary in cases where raw material supplies are erratic and knowledge about more sophisticated processes is absent, firms like Dynamic would be



mainly concerned with meeting fairly basic production requirements. Innovation oriented exploratory or experimental work would then often be negatively affected, inhibiting technological learning. In this case good relations with suppliers may be regarded as having an important but indirect influence on technological learning.

### **Firm-to-firm networks**

The firm has fairly good linkages with other firms, (including peer firms), from small to medium sized enterprises. This incorporates enterprises within the same line of business (who are often competitors) but excludes raw material suppliers which have been analysed separately above. Dynamic has good entrepreneurial capability with good market intelligence skills, including knowledge of the status of competing firms. Information on competitors is obtained mainly through non-formal means which includes personal contacts with owners or a few key personnel of competing firms, including large ones.

Dynamic has also occasionally managed to secure sub-contracting jobs from large firms. The sub-contracts involve the manufacture of specific items used as intermediate inputs in the production of commodities required by the customers of the large enterprises. Dynamic has consolidated relations with some large firms with capacity to offer attractive contracts with potential to earn the firm good income. This has occurred partly because of the firm's good track record for delivering orders on time as well as a high level of quality consciousness. There is regular exchange of business information between Dynamic and other firms which is mutually beneficial. In cases where relationships with owners are somewhat problematic, Dynamic seeks to befriend senior employees within competitor firms who are less suspicious

of any ulterior motives. In such cases the employees seem easier to deal with and are more forthcoming when it concerns exchanging information. The type of information exchanged includes sources and supplies of scarce inputs. Occasionally it also involves sharing information about customers in need of large quantities of products which other firms with limited production capacities are unable to meet.

The success of the firm in collaborating with other firms in sharing important information which is mutually beneficial to the parties involved is noted. However, the ability of the enterprise to access and share key business information, especially on technical matters, in this sector is largely to do with the entrepreneurial skills of the owner. It is less to do with the role and significance of networks in the development process. In any case, firm-to-firm networks in this case are not as developed as the other kinds of network discussed in this case study. The paragraph above suggests that the basis for trust is often not present for such networks to develop.

### **Enterprise support networks**

The enterprise exhibits good technological learning qualities as well as good networking qualities with various enterprise support organisations. Examples of technological learning associated with these networks are described below:

1. Dynamic has forged a good relationship with the Department of Metallurgy, Ministry of Mines and Energy. Another key network partner is the Metallurgy Research Institute. The Institute, which is

housed within the University of Zimbabwe, has in the past been frequently consulted by Dynamic with respect to analysis of brass material and quality issues at product initiation stages. Regular consultations with personnel of the institute were made when products such as brass handle plates, nose brackets and other items were launched during the research and development phase. This culminated in the manufacture of products that have gained wide acceptance in the domestic market.

2. Sustained linkages have been established with the Intermediate Technology Business Service Centre (Harare based, and situated in close proximity of Dynamic within the Willowvale industrial area) . Equipment has in the past been hired in on a fairly long term basis from the Centre. A good example of such networking arrangement is with respect to the fly press, already mentioned, which has been hired by Dynamic on a continuous basis for more than 2 years at the time this information was gathered. Networking with Intermediate Technology helps the firm to gain access to equipment and machinery which otherwise the firm would not be able to access - strengthening the company's technical capacity to produce a diverse range of products competitively.
3. Networking with Empretec<sup>1</sup> - Dynamic is an 'Empretec' (a term referred to entrepreneurs who have gone through an internationally

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<sup>1</sup> Empretec is a well known private not-for-profit SME oriented entrepreneurship development programme in Zimbabwe. It enjoys considerable external donor assistance through the United Nations Development Programme (UNDP) and its partners. Empretec runs several training activities designed to improve enterprise performance overall (Empretec , 1996 – 1999).



reputable two-week Empretec Entrepreneurial Training Workshop), having successfully completed the training in 1998. Dynamic continues to maintain strong links with Empretec on an on-going basis and has since 1998 participated in two other Empretec organised seminars centred upon enhancing management skills. Empretec continues to link Dynamic and many other associated enterprises to existing and new enterprise development programmes supported by other enterprise support actors, local and international.

4. Examples of such programmes include technical and non-technical programmes supported by the United Nations Development Programme (UNDP), the Zimbabwe Investment Centre, financial institutions and other private enterprise support actors. In recent months, Empretec managed to link Dynamic to a UNDP project which centres upon energy conservation for manufacturing oriented SMEs. The project covered 50 SMEs and had a duration of 18 months. Dynamic has strong interest in such networks as demonstrated by its active participation in specific activities designed to assist in the acquisition of new knowledge through external linkages.

Furthermore, Dynamic is one among a few small light engineering firms that have in recent years been involved regularly in participating in 'Small Business Expos' organised by a consortium of small business support organisations in Zimbabwe and involving Empretec, ZNCC, ZimTrade<sup>2</sup>, CZI and a few other private sector actors. The Small Business Fair is an annual

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<sup>2</sup> ZimTrade is a state supported agency which is involved in promoting Zimbabwean firms to access international markets. The organisation provides information on potential trade

event which has been held over a one week period in Harare from 1997 to date. Having graduated from its Training Programme, Dynamic has grown to become a model enterprise for Empretec. The enterprise enjoys regular visits from Empretec business advisory personnel and partners of that organisation. The firm is listed on the database of enterprises affiliated to Empretec. Each time new training programmes arise, the enterprises listed on the database are contacted first and often receive preferential treatment in the selection process. For example, it was through this linkage that Dynamic was able to become one of the 50 enterprises benefiting from the UNDP supported enterprise support project referred to above.

The association with Empretec, an institution which has received substantial UNDP funding over many years proved to be useful for Dynamic with respect to its participation in the project.

In so far as networks are associated with technological learning, in the case of Dynamic, specifically targeted Enterprise Support Organisations have indeed been instrumental in fostering learning within the enterprise in terms of development of new products. Specific technological advisory services have been offered to the firm in a spirit of co-operation which resulted in the successful introduction of new products. The technological support services have also been complemented by general entrepreneurship development services and associated networks further assisting the enterprise to develop technologically.

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partners for both SMEs and larger enterprises, as well as facilitating linkages between potential trading partners (ZimTrade, 2000 – 2001).

## **Concluding remarks with respect to Dynamic Engineering**

There is a virtuous circle in this case in that the existing level of technological learning within the enterprise has strengthened the ability of the enterprise to benefit from networks. Networks indeed are critical in this case but they have a relationship with technological learning which is mutually reinforcing. High technological learning enables the firm to gain more from the networks than would otherwise be the case if technological learning in the enterprise was low.

High technological learning and a new product focus, complimented by a drive to improve existing products, help the firm to seek valuable networks that further sharpen its technological learning. This strengthens the enterprise to produce high quality products which are market competitive. Some representatives of enterprise support organisations are motivated to work with well focused and promising enterprises like Dynamic because they often use and single out such firms as case references for successful service delivery.

For a firm like Dynamic, there are a number of observations that need to be made. First, the entrepreneurial drive and innovation orientation of the owner, who has high technical management skills based upon good technical training and industrial exposure, enable the firm to become competitive within the sector in which it operates. These same factors contribute to the ability of the enterprise to learn technologically from various networks. With reference to the study hypotheses, various kinds of networks are indeed important for technological learning. However, for the learning to take place to any significant extent, there must be in-house capacity,



including commitment to learn. An important question relates to the process of generating the capacity to learn within an enterprise like Dynamic. It is clear that the interactions with a variety of outside actors through networking to a large extent also helps to build the learning capacity in the firm, which is the virtuous circle referred to above.

The role of outside actors needs to be further clarified and their willingness and ability to participate in and support specific activities and projects through networking. In particular, enterprise support networks that move beyond loose cooperation on general issues have proved important to technological learning at Dynamic. It is also noted that on-site specific follow-ups by enterprise support organisations is vital for the facilitation of technological learning both during the initial project phases and after projects have been completed. In the case of the latter, cooperation with existing enterprise support organisations and new ones on new ventures and activities is important in order to build upon the existing technological resource base and move to higher levels of technological learning. This has for example been so in the case of the relationship between the enterprise and the Metallurgy Research Institute and to some extent Empretec.

With respect to other networks, customer networks have clearly been vital in this case and Dynamic's commitment to forge them and learn from them is noteworthy. Supplier networks operate more indirectly by enabling a more stable environment in which important raw materials and other inputs can be guaranteed. Firm-to-firm networks seem to be least developed and have difficulties which relate to the establishment of trust.

## 6.2 A Case Study of Classic Engineers

**Classification:** *Average to good networker but with a higher level of technological learning characteristics than might be expected from the general statistical association between networking and technological learning*

### Background

Classic Engineers was established in 1996 by Mr Innovation, who is the managing director of the company. Innovation had worked in various capacities, from junior technician to senior company executive with a number of medium and large engineering firms for more than 15 years prior to establishing his own firm. The firm is highly innovation oriented and has managed to withstand competition from the more established larger firms.

The company is involved in components production, final product assembly and full sequence production from raw material to finished products, in the process manufacturing a variety of customised products. The company specialises in design and construction of mechanical components and machinery. The main activities of the company are the fabrication of tanks of various sizes and shapes, steel pallets, water carts and some steel structures such as window frames. The company is involved in maintenance installation of machinery in different companies. It has capacity to manufacture a variety of other products which include brick presses,

construction equipment of various sorts and agro-processing equipment and machinery.

The following also characterises the enterprise:

- The firm has adopted a strategy of responding to tenders swiftly, submitting its tenders and quotations to potential customers without delay. This provides the firm with a competitive edge over other firms, especially larger firms that face some bureaucratic bottlenecks which are related to their size and management style. Classic is able to start projects with customers much earlier than firms that take longer to supply required tender information to potential customers.
- The firm targets a niche market in the form of large institutional customers with high value jobs in design engineering, machinery installation and pipe networking. This is possible because the firm has acquired the requisite level of competitiveness in terms of timeliness of delivery, pricing of products and services, offering high quality products and services.
- The firm has an innovation focus which is centred on accumulating both technical and non-technical knowledge on an on-going basis on the job. This is done with a view to improving competitiveness and developing new products through the application of new technology. The firm has capacity to source information on new products and designs on the internet. Browsing on the internet for new product designs is done by the owner of the firm on a regular basis. This gives the firm a competitive edge over other firms within the same



sector. Most SMEs in the country lack direct access to internet services. Those with such access only use the facilities for basic communication and not to advance their technological knowledge as is the case with Classic.

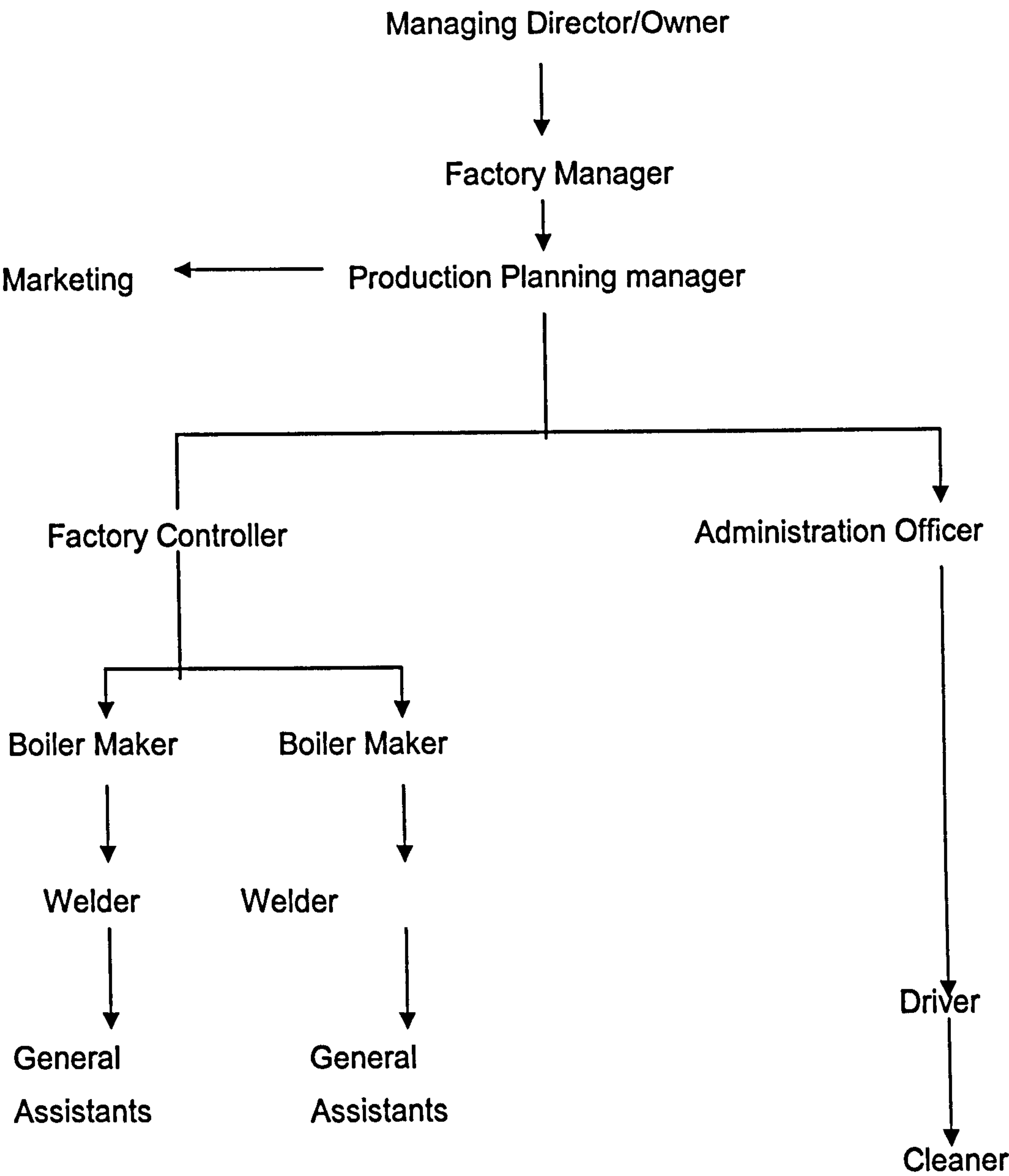
### **Organisational structure and human resources situation**

The firm's workforce is organised in mobile and flexible teams which can be switched from one job to another fairly quickly, depending on need and the priorities set by management. The company started off with 6 employees growing to the current 16, excluding the director. The company has a good contingent of skilled and semi-skilled employees, some of whom have accumulated substantial experience which is pertinent to the firm's operations. The firms also engages contract workers on a need basis.

The managing director who is the principal owner of the firm is responsible for doing all the strategic work with the support of a small team of senior managers and other staff. The managing director is supported by a team of young cadres most of whom are below 30 years of age.

Classic has put some organisational structure in place which is described by the organogram below:

**Organisational Structure**



The firm has a bureaucracy-free structure and enjoys a good level of flexibility in its operations. Key decisions within the firm can be made without delay and the owner often makes them after consulting a small team of managers made up of two or three people. Quite often, however, major decisions are made by the owner with minimal or no consultations.

The personnel profile is provided in the table below. The table shows the names, qualifications and experience of workers. This information was made possible through the cooperation of company management, and also because records are readily available<sup>3</sup>.

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<sup>3</sup> The situation with respect to other firms studied where such information was sought presents a different picture. Many firms do not keep employee details. There are no records or documented information about personnel and in some cases the management of firms lacks accurate information. In cases where employees provided the data on their training and educational background, such data could not be verified.



**Table 6.2: Personnel profile for Classic<sup>4</sup>**

NAME	QUALIFICATIONS	EXPERIENCES (YRS)	RESPONSIBILITIES
P. Muchanyara	Boiler maker, ND in Mechanical Engineering	5	Factory Manager/Foreman
T. Shabani	Boiler maker, ND in Mechanical Engineering	5	Production Planning & Marketing Manager
C. Maredza	Fitter & Turner (class 1)	3	Factory Controller
M. Matora	Business Studies Degree	2	Administration Officer
D. Muchasa	Boiler Maker (class 1)	5	Marking & Fabrication
G. Chigovera	Boiler Maker (class 2)	3	Marking & Fabrication
H. Makari	Semi-skilled Welder	1	Welding
R. Ncube	Semi-skilled Welder	-	Welding
T. Maramba <sup>5</sup>	'O' Level	-	Assistant
O. Murara	'O' Level	-	Assistant
S. Rambai	'O' Level	-	Assistant
P. Gora	'O' Level	-	Assistant
M. Matambe	'O' Level	-	Assistant, Stores
C. Muchatuta	'O' Level	-	Assistant
E. Maupa	Driver's licence Class 2 & 4	-	Driver/Messenger

<sup>4</sup> All the names given are pseudonymous. This is done to protect the identity of the firm.

<sup>5</sup> The only person known to be related to the owner at the time this information was collected.

When compared to other firms within the same sector, Classic comprises a team of well trained cadres. As can be noted from the list of the firm's personnel, their qualifications and experience, it can be inferred that the workers are fairly young. There are reasons why Classic has chosen to employ this type of personnel. According to information generated from the firm, two considerations stand out. Young persons are easier to train on the job; they are easier to push or mould in a certain direction than older people who are likely to have succumbed to undesirable work habits. It is believed by the owner that the 'right personnel' can be moulded in new directions through on-the-job training and learning. An analysis of the personnel profile by qualifications, employment experience and background which was complimented by detailed case informal discussions reveals that the company has good capacity to generate new knowledge through its personnel. However, it is acknowledged that good experienced workers are also needed alongside the younger and less experienced workers for firms like Classic to achieve desirable levels of success. The issue therefore, seems to be whether the firm is capable of sufficiently combining the other attributes perceived by management to be important with requisite or optimum levels of experience that key personnel within the firm need to have.

Besides its full-time staff compliment as listed, Classic also hires some contract workers, whose number vary from time to time. This occurs especially at times when business is in high demand to the extent that the available full-time workforce is not able to cope with the volume of business. The strategy helps the firm a great deal in that it does not have to pay large

overhead costs for staff who are not fully engaged during some periods, a situation which cannot be predicted easily.

The information supplied by the owner reveals that Classic offers competitive above average wages for its managerial staff. For example, although exact figures could not be sourced, in recent years, the company was able to attract at least two young technical professionals from larger firms in the sector. The company has managed to retain all its key staff in recent years, a situation that to some extent demonstrates that the firm is a competitive employer. The company offers performance allowances, especially annually, as an incentive to motivate its staff. Company staff are rewarded for working well and for their commitment to their jobs through bonuses which are usually in the form of a thirteenth cheque. At the end of 1999 two senior technical staff had housing stands purchased for them in a local residential area as a reward for a year's hard work.

The flat and flexible management structure which fits well with the relatively high technical competencies of the available personnel is perceived by management to enhance the production capability of Classic making it a competitive firm. According to the owner, the firm's production personnel have a good record of meeting production targets and their level of productivity in executing various assignments is high. This information was also verified by a University of Zimbabwe production engineer who has had a relationship with Classic. The engineer, who was interviewed as part of the case study investigation, has participated in convening technical training



courses for the owner which involves mastering advanced methods like AutoCAD<sup>6</sup>.

**Range of products manufactured and their growth over time**

The company is involved mainly in manufacturing that is designed to meet specific needs of customers. This implies that the product design and development of most new products are heavily influenced by the demands of customers at any given point and time. There is also a high degree of originality in the output or content. The firm is consistently involved in in-house product innovation and basic research.

Based on data collected between 1999 and 2001, the classification of products and related revenue are as follows:

<i>Product/Service</i>	<i>% contribution to sales revenue</i>
Steel tanks	60
Steel pallets	20
Pipe work	10
Others	10

- The products are in four main classifications, (i) components; (ii) final product assembly of the components; (iii) production of finished products from raw materials and; (iv) local production of plant, equipment and machinery.

<sup>6</sup> This is computer aided design used to draft new products or making product adaptations. In the case of small enterprises in Zimbabwe, only a few firms (often quite progressive) have mastered the use of this technique which demands a certain degree of technical competency.

- Distribution of the products is also another service of importance in after-sales product support.

### **Production capability**

Classic is knowledge-based with a competitive edge in designing a good range of manufactured products as shown above. Classic is distinguished by its focus on new products and their design and product adaptations. The firm is well endowed with production engineering expertise with at least four in-house technical professionals being at the forefront in the assimilation of product design and undertaking of both major and minor process adaptations to meet market demands. This analysis and conclusion is supported by the aforementioned University of Zimbabwe engineer who has had links with Classic over many years. The firm's innovative strategy actively seeks to surpass original performance standards of the technology used by its counterparts and competitors which involves other small and larger urban based firms operating within the same technical area. The firm seems to have some good inside knowledge about the production capability of competitors. The fact that the owner has at one time been an employee of some of the firms which Classic is now competing with seems to give the firm an edge over those other companies.

From the analysis so far, Classic can be classified as a knowledge intensive firm. The firm does not have a great deal of equipment and machinery in its factory. The main machines available are a rolling machine, two drilling machines, one small lathe machine and at least 4 medium sized welding machines and a medium sized compressor. The estimated value of the equipment and machinery based at the factory is approximately US\$26 000.

The rolling machine in use was designed and produced in-house by the owner and his personnel in 1998. The machine, valued by the owner at about US\$8000, represents a major piece of production technology for the company's operations. Several technical adaptations were made to it, demonstrating that the company has a high degree of technical capability. The technology was introduced with a view to improving the manufacturing process and designed to produce a similar range of products to those that were currently in production. Plans are also in place to produce more products to increase the product range using the technology. With the use of the machine, production costs for certain items, for example, rolled steel cylinders, are said by the owner to have been cut by more than 40%, resulting in increased competitiveness of the enterprise.

The type of production system that the company is undertaking is *Just In Time* (JIT)<sup>7</sup>, a fairly common term used by the more dynamic range of manufacturing companies in Zimbabwe as elsewhere in the world. In this regard the company purchases raw materials specifically intended for particular customer orders. There is no incurring of stocking costs. To cater for smaller scale clients, when there are no customer orders, Classic also produces other products such as window frames, water carts and brick moulding machines that are available in small quantities either as finished samples in the workshop or as work in progress. These other products however, do not constitute a major output for the company and appear to be exploratory products.

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<sup>7</sup> JIT – Just-in-time production refers to the process in which inventories are minimised and provided just before they are required in production or by customers.



Given the scale of the company's activities in tackling large and complex jobs for big clients as this relates to available production technology, it is clear that Classic is a knowledge intensive firm which depends to a great degree upon its skilled technical personnel. However, as the company handles more sophisticated jobs over time, a further investment in acquisition of more advanced equipment and machinery is required to strengthen its production capabilities and enhance future competitiveness. This investment is, however, currently a lesser priority to management than sharpening the technological management skills of the company's production personnel.

### **Employee training**

In-house staff training is recognised by management as important to the firm's survival and growth. The training is both planned and ad hoc with a great deal of the training being done on the job. However, the in-house staff training can only be described as average or satisfactory in the absence of large amounts of money committed to such an endeavour. The more experienced staff employed by the firm are engaged in technical mentoring of inexperienced personnel who were either unskilled or semi-skilled on arrival. The quality of on the job training can be described as satisfactory. There are however, no records to show what kind of training is being conducted within the firm at any particular point and time. Training within the enterprise is done on an on-going basis as part of the production process geared towards the manufacture of specific products targeted at particular customers. Generalised training by itself is not perceived as a priority area. What is critical to the firm, as it emerged from discussions with senior

management is to gear its workforce especially factory staff to produce good quality products with a view to satisfying a growing market. The employee training therefore, is strongly linked to customer linkages to the extent that whatever is done in the area of training is carried out on a 'need to know' basis in order to meet specified and known requirements of the market and not to satisfy some undefined idealised goals or targets.

### **Quality management**

The company pays considerable attention to product quality and improved processes in its production operations. Since start-up, the company has made several innovations to its production process, introducing a number of products and improving product quality. As part of a product improvement plan, the company has added a breather to steel tanks, designed by Classic in-house. The company's rolling machine that was described above, is contributing to product quality improvement and lead-time reduction.

Although the company does not have a documented quality assurance system, the workers always embark on visual inspections. From case study discussions and on-site observations, staff and management are well committed to quality issues. The staff seem to be sufficiently skilled and the firm collaborates with the Standards Association of Zimbabwe with a view to improving product quality. The need for quality awareness and continuous improvement is stressed throughout the organisation. Continuous improvements have been made in the quality of products as the company has gained experience in new product design and development.

The firm has plans to set up quality management systems leading to ISO 9002 certification, an international quality standard. The company aims to be a top leader in quality in its products and services offered. The company's quality management system and relatively high product quality are linked to customer linkages which include associations with large institutional customers. The associations mainly involve feedback on customer needs which Classic strives to meet. No direct material or technical support is provided through the linkages. Other linkages such as supplier, firm to firm and those with technological development organisations are also noted as being important to the management of quality issues within the firm. These and other linkages are discussed below.

#### **Firm's involvement in R & D**

Although the company does not have an explicit research and development plan, R&D within the enterprise can be described as good. It is tied to the development of products targeted to specific markets for particular institutional customers. The firm's production processes are knowledge intensive and there is considerable application of human skills in the design and development of new products. Such products include tanks and steel pallets of various types and sizes. Although the exact monetary investment in research and development activities cannot be spelt out due to lack of accurate records and information, the firm introduced many new products through in-house R&D over a 4 year period from 1997 to 2000. When the firm compares itself with other SMEs within the same sector, the perception is that it has a very competitive product development strategy and a sound technological development approach which emphasizes knowledge and



competitiveness building. In the process the company seeks to place itself in a stronger position to produce higher quality products and services than most of its competitors. The product development strategy of Classic centres upon high value and knowledge intensive products with a high return. The products and services produced and delivered are unique in that very few other SMEs produce them. They demand a great deal of technical expertise and managerial dynamism which is absent in most small scale enterprises in the country.

Also of note in terms of R and D is that Classic has access to internet services in-house and has mastered the art of using internet services for technological advancement (although not for networking). It is from the internet source that technical designs for new and innovative products are often obtained and adapted to suit the firm's situational needs. The firm has been very adventurous in sourcing new innovative ideas and expertise over time through various technology networks.

The firm's involvement in research and development is also linked to the company's strong relationship with customers, suppliers and enterprise support organisations. Some technical counselling has in the past been sought from suppliers and technological support services. Such services are particularly valuable to the firm with respect to new product designs and specifications.

### **Level of productivity**

In the absence of records, the owner and senior management were asked to rank the productivity of the enterprise relative to competitors, based on

self-assessment. The perception within the firm, which is backed up by on-site observations is that Classic is a highly productive enterprise. When comparisons are made with larger and more established and sophisticated enterprises based in Harare, it seems that the firm positions itself well within the upper quartile of most productive firms involved within the same sector. This assessment is confirmed by the market in-roads the firm is making with larger institutional clients, big firms and municipal authorities some of which have in recent years made several repeat orders for contract assignments.

## **ANALYSIS OF NETWORKS**

### **Customer networks**

Classic has managed to establish a strong relationship with its growing number of institutional customers which comprise large as well as some small and medium sized firms. According to verbal feedback that company management was receiving from customers, there seems to be a good level of appreciation of the firm's products and services. For example, there is evidence of repeat orders from several urban municipalities, for pipe networking; from petroleum companies, for steel tanks; and from other SMEs in and around Harare for steel pallets and steel tanks. Collaborative initiatives are also frequently embarked upon with large institutional customers who supply their own raw materials and inputs which Classic uses for executing specific assignments. This development is welcomed by Classic because it reduces the cash-flow burden of the firm, especially against the background of high levels of inflation and unpredictable rises in the prices of raw materials. Classic is also occasionally jointly involved in design and maintenance engineering work within some of the customer

firms. In such cases technical personnel from Classic work side by side as consultants with those from the firms. The expectation from such joint efforts are that there will be a better quality service and output for the institutional customers.

Classic seems to enjoy a high product and service acceptance in the market with growing incidences of collaborative initiatives with other firms in areas of the firm's specialisation as well as associated activities. This is largely because the calibre of personnel manning operations within the factory and on specific job sites is perceived by customers to be of good standard and there is within the firm a good level of consciousness about generating high levels of competitiveness in product quality and quality management in general. The firm's market competitiveness is evidenced by its ability to secure on a regular basis lucrative tenders from large private companies, in particular, those engaged in marketing petroleum products.

Regarding business in which the company has an interest, Classic acts swiftly, keeping it way ahead of most of its competitors. The firm executes its jobs fast and has a good track record with customers with respect to delivery. The firm regularly maintains specified delivery schedules. This fosters good relations with customers which are important for networking trust. The owner takes a very keen interest in marketing, being the prime mover on these issues. The entrepreneur is a good networker capable of establishing, maintaining and nurturing good relations with customers. He is involved in negotiating all major contracts, including those involving collaborative work with customers. However, some of the key marketing



functions, in particular those of a routine nature are devolved to the other managers of the firm.

What emerges from the foregoing analysis is that Classic's high productivity, quality focus and versatility in doing business with a variety of customers assists in generating trust and confidence which is good for networking. The networking qualities of the firm complimented by the owner's tacit knowledge of the industry in which the firm operates, has proved to be critical in fostering the firm's technological learning. The firm's action orientation, its ability to meet the dynamic needs of a sizeable customer base and the ability of Classic to position itself well relative to competitors is reflective of the firm's strong technological learning. The ability of this enterprise to exploit both old and new networks for purposes of technological learning is also evident.

The extent to which customer networks are associated with technological learning is an issue of considerable interest in this case. It is noted that the firm's core business is highly customized: design engineering assignments, which is a specialised area dominated by large established firms, where only a small number of indigenous firms are active. This means that in order to thrive and remain competitive, learning and innovation is an essential characteristic of the enterprise. The firm does not supply products off the shelf but through customer networks from which business which demands high quality standards in delivery is generated. Regular feedback from customers and sustained interactions with respect to quality and type of engineering services offered and needed have over time enabled the firm to generate new technical expertise to meet growing customer demands. Co-

operation from customers with respect to supply of inputs to complete jobs gives the firm space to learn to deliver high quality services and products.

### **Supplier networks**

The study reveals that Classic has a cordial relationship with a number of its suppliers of various raw materials as revealed by evidence from discussions, company files, and documents. However, a close analysis of how Classic associates with its suppliers seems to indicate that the association is not as strong as that relating to customers. In this respect, the fact that many large institutional customers enter into an arrangement with Classic in which they organise the supply of their own inputs and materials, sometimes with Classic's facilitation, needs a special note. It is this collaborative arrangement which has reduced the need for Classic to commit large financial resources to the purchase of raw materials from the existing suppliers. In any case much of the firm's work involves design manufacture which entails limited use of raw materials sourced directly by Classic.

The firm purchases inputs which range from stationery to workshop accessories such as steel pallets, welding rods, paint and other hardware goods. These are sourced from a variety of suppliers, the main one being Norton Supplies Private Limited, one of the largest local suppliers of a range of hardware and engineering materials. Other suppliers, based in Harare, include Lysite, supplying mainly steel pallets, Tube and Pipe, which supplies engineering pipes and Yeoman which also stocks piping materials.

A selected number of suppliers provide classic with some technical advice relating to the utilisation of raw materials, in particular on more complex jobs.

The technical support given by the suppliers is solicited by Classic on a need basis and is not a regular feature of the firm's interaction with suppliers. Nevertheless it is a relationship that Classic values considerably, but not as highly as customer networks.

For more than 3 years the firm has been operating a 30-day credit facility with Norton Supplies. The account with a negotiated maximum limit in excess of US\$2 000 allows the firm to secure all essential materials of the company's choice for its on-going manufacturing activities and site specific assignments. This arrangement is of great help to the firm's cash flow management since it does not have to pay cash for the goods acquired.

Indications are, however, that the collaborative arrangement with customers in the sourcing of raw materials needs to be supported by other ways of securing inputs. It is envisaged that Classic needs to fill in the gap created by those customers who are not comfortable with purchasing their own inputs before jobs are undertaken. From discussions with management of Classic, it is anticipated that the firm is moving in the direction where relations with suppliers which take more the form of networks are growing in importance more than they have been previously. The need to consolidate and strengthen the relations stems from the fact that the enterprise is targeting a variety of potential customers whose demands are expected to grow in the foreseeable future. Good linkages with suppliers of various raw materials is critical to the firm in enabling it to access the inputs that facilitate the ability of the company to meet the demands of customers.



## **Firm-to-firm networks**

Classic seems to be very well networked informally with other firms. The firm has managed to establish major contacts with senior managers and executives of a considerable number of firms, some of them being large companies. Certain key technical personnel of the company are also associated strongly with other firms through contacts established over several years of previous employment with them. Apart from the execution of some sub-contracting assignments by the firm in recent years (originating from large firms), which demonstrates the strength of firm-to-firm networks, these linkages illustrate the importance of large firms as a potential 'breeding ground' for future entrepreneurs. In some respects, firm-to-firm relations have been enhanced through personal contacts established at management levels. Contacts with key individuals located within particular firms (both large and small) established over many years have proved to be useful to the enterprise as the business has been established and consolidated at a faster pace than would otherwise be the norm.

However, a closer analysis of the relationship between Classic and other firms involved in the same sector shows that the quality of such associations currently is not as high as might be expected. Incremental learning through inter-firm networks does not seem to be a strong feature of the enterprise currently although it is deemed to be important. There are some clues why this may be the case. Firstly and most important, although there is a considerable degree of association, both formal and informal, between the enterprise and other enterprises, many of the contacts have been made in previous years through more than a decade of exposure within the same

industry. Having gone through a considerable period of learning in the past, the exposure Classic's key personnel have had with other firms within the same industry in the past is associated with the current capabilities of the firm. Secondly, linkages forged in the past through employment in larger firms engaged in related business and sub-sector by the entrepreneur and some of the key personnel have assisted the firm to sharpen its technological learning which have become crucial in exploiting networks for purposes of learning. However, the forging of new firm-to-firm relations with potential benefits to learning is an area that is not clear from the evidence generated in this case study.

### **Enterprise support networks**

Classic has what can be described as fair or satisfactory linkages with several technological development services. Whilst it seems that there is nothing really spectacular about the technological development linkages forged to date, the enterprise is well endowed with information about where to source technological assistance when it requires to do so. The company does not seek generalised forms of technical assistance to address general problems. Company management is sharp in defining what it wants in addressing specific technological innovation needs designed to meet the needs of an increasingly competitive market.

Between 1997 and 2000, the firm forged some relations with the University of Zimbabwe Departments of Mechanical Engineering and Business Studies. The Department of Mechanical Engineering has held short technical supervisory training courses which the owner of Classic participated in and acknowledges as being very useful in adding new technical expertise for his

firm. A good example of new technical expertise gained includes new product design using AUTOCAD, a computer aided design package described earlier in this case study. In addition, the firm has sharpened its skills in product finishing. The firm acknowledges in its documents the importance of the technology back-up support services provided by the University of Zimbabwe's Mechanical Engineering Department. During several formal and informal discussions held by the researcher with the owner of Classic, there were repeated references to technical support through the University of Zimbabwe source. The Department of Business Studies of the same university has also been useful in providing a business studies graduate hired on a full-time basis to provide administrative management support to the enterprise. Prior to that, business management had been identified by a team of external experts provided through a private not-for profit project to be an area requiring attention by Classic.

It is noted here that a number of university departments, including those mentioned are making some attempts to scale up their services to the community by demonstrating that they are useful to the development of SMEs in the country. This is unlike in previous years when the focus was on purely academic activities. The university personnel involved can cite such work during their annual performance appraisals with the possibility of enhancing their chances of promotion. It is within this context that the departments are actually proud to be associated with firms like Classic and similarly progressive ones. In this case, there is something mutually beneficial to the parties involved in the network.



Some other important sources of technical knowledge for the enterprise include the following:

Harare Polytechnic College (an important source of new technically oriented graduates);
Standards Association of Zimbabwe (product certification); and
Scientific Industrial and Development and Research Centre (research into new production processes and methods)

However, the quality and strength of each of the specific technological linkages for learning purposes is variable. For example, newly qualified graduates from the Harare Polytechnic form a source of young trained and qualified artisans for Classic. New technical personnel have in previous years been attached to various firms involved in a similar line of business. Classic often targets a limited number of well referenced newly qualified artisans with limited industrial experience who later become part of the full-time staff compliment of the firm. The artisans fill specific technical skills gaps.

The Standards Association of Zimbabwe assists Classic to maintain high quality standards and be on track for planned ISO certification. The anticipated certification is expected to help the enterprise to become a competitive firm in the Southern African region despite lack of a clear time frame for this at the time the study was done. All firms with plans to enter the regional and international market need to liase and work closely with the

SAZ as an accepted norm for manufacturing entities. The SIRDC also provides technical expertise in the area of new product development. Classic was identified through a SIRDC donor funded programme as a potential beneficiary of a small enterprise support project which sought collaboration from a limited number of SMEs in the country. However, the firm in the end failed to meet the established criteria for beneficiary firms for the project. This was the case despite generating a great deal of interest to the SIRDC project personnel earlier. The lesson learnt from this, however, is that networking between firms and enterprise support agencies is possible when there is a clearly defined output and relationship between the two parties. In this case Classic was going to provide premises and its commitment to work with project personnel in technical areas where gaps were identified to exist. Low profile contacts seem to have continued to exist between Classic and the SIRDC personnel.

Technology networks have brought to the firm new knowledge, including new production management techniques which enhance the firm's productivity and innovativeness. Within the firm, in-house training and capacity building has been strongly facilitated externally by specific ESOs. The firm's ability to target ESOs that are value adding, its pro-active approach to dealing with ESO helped by its commitment to technological learning enhances its ability to exploit networks for learning which are of benefit to the enterprise.

### **Concluding remarks with respect to Classic Engineers**

Like Dynamic, Classic has, to some extent, moved beyond process innovation to product innovation, an indication of a high level of technological

learning. The high degree of entrepreneurship, good technical background and training of the owner and key members of the management team and a flair for innovation are key factors that enable Classic to exploit networks to enhance technological learning. The knowledge generated over many years of networking outside Classic is critical to the technological learning and rapid success of the firm. Although it appears from the statistical analysis in chapter 5 that Classic is not an especially strong networker for its technological learning index, this is only because the firm does not see value in generalised networking, but rather in highly strategic networking<sup>8</sup>. This important factor and others determine the extent and ways in which the enterprise is engaged in networking.

An important question is: 'What can be concluded from this case as far as the study hypothesis is concerned?' The answer to this question is that there is a great deal more in this firm's ability to learn technologically than the mere existence of networks. For example, I have noted the firm's strategic use of the internet for product innovation. Networks are indeed important in that they do contribute towards technological learning. However, technological learning benefits can only be derived to a large extent within an environment in which there is good capacity to learn technologically within the enterprise.

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<sup>8</sup> The case of Classic also illustrates the flaws of the method of compiling the composite networking index used in chapter 5. It was based on simply adding together the different networks (customer, supplier, enterprise support and firm-to-firm) whereas in this case it is obvious that the limited number of enterprise support networks should have been weighted differently from the others.



### 6.3 A Case Study of Average Metal Fabricators

***Classification:*** Average to good networking qualities with proportionately lower technological learning as indicated in the chapter 5 scatterplot. Reflects lack of dynamism of enterprise in terms of networking qualities/linkages and more so in terms of technological learning

#### Background

Average Metal Fabricators was founded in 1980 by Mr Average (50 years). The metal fabrication business is based at Gazaland, Highfield in Harare, one of the oldest areas housing a variety of enterprises, mostly micro-informal ones but with a growing number of formal SMEs. The enterprise began as an informal enterprise employing 3 persons on a semi-permanent basis. Average has since become formalised although it has continued to have the characteristics of an informal business venture for many years after its establishment. This is principally because of the management and organisational style of the enterprise which has characteristics associated with a non-formal enterprise. The business has also been influenced by locational factors and the way similar enterprises within the area are organised. The owner whose formal education level is up to Standard Six, Primary School, was informally trained and exposed, working, as an informal welder since the early 1970s. He was also employed as a welder in various small scale firms between 1974-79, generating considerable experience in

metal fabrication. He has, however, failed to advance himself professionally through acquisition of further formal educational or professional qualifications.

The firm's core business is centred on security metal fabrication and manufacture of wrought iron products such as manual gates, window frames, burglar bars, sliding doors and security screens. These products constitute more than 90% of the sales revenue.

### **Organisational structure and human resources situation**

Average Metal Fabricators has two directors, Mr Average and his brother, who is a 'silent partner'. In practice, until recently the silent director had virtually no direct involvement in the business since he has a full-time job outside of Harare. The involvement is quite informal and more to assist his brother's enterprise. The business has a flat structure, with the owner acting as the managing director, assisted by an administrative assistant, a marketing supervisor and production supervisor. The enterprise has an unclear middle management structure with rather confusing reporting lines.

Although the business is formerly constituted as a private limited enterprise with a two-member board of directors, in reality the managing director who is the de-facto sole owner of the enterprise, is the main driving force. The owner has had many years of exposure and experience in metal fabrication work and has been involved in several management training programmes organised for small Harare based companies. However, the firm's structure and management suggests little or no benefit from training. There is a lack of clarity of roles. The owner seems to have failed to put together a stable,

cohesive and motivated team. Production personnel do not seem to be well integrated with administration staff. A number of personnel in production seem to be idle a lot of the time as the firm is unable to secure sufficient contracts to keep the staff fully engaged. However, the owner seems to over-load himself with work and responsibilities which range from general administration and management, marketing and other tasks which can easily be delegated to other personnel, provided they are of the right calibre and are adequately briefed.

At the time the study was done, the firm employed 15 people. The firm had 1 person who neither fitted well the formal definition of 'skilled production worker' nor 'semi-skilled worker'. The person also acted as the production supervisor. This person, aged 55 years had more than 25 years of relevant industrial experience working in the medium to large scale formal sector before being retrenched during the year 2000, after which he joined Average.

Although he is known to be well experienced and knowledgeable in basic metal fabrication work, the supervisor was not during his working career exposed to formal professional or tertiary training. He has limited formal education up to primary school level only. He gained all his metal fabrication expertise on the job while employed. Formal professional tertiary training is ordinarily required in Zimbabwe to enable any factory worker to pass a trade test which in turn can propel him or her to be certified as a skilled worker. For this reason, the supervisor may still be formally classified as semi-skilled in the absence of relevant professional qualifications - a description which may in practice not be quite true. It is, however, generally acknowledged in



the industry that while industrial experience is valuable, it alone is insufficient to enable technical personnel to perform more sophisticated functions, such as operating advanced machinery and equipment.

The company has 5 persons categorised as semi skilled workers and 9 categorised as unskilled workers. Two semi-skilled persons have some technical training with basic metal fabrication qualifications at certificate level from vocational training institutes. The other 3 semi-skilled personnel have basic fitter and turning and welding certificates, again from vocational training colleges. The grade of these certificate holders is, however, well below that offered to the grade of artisans normally classified as 'skilled'.

The owner has little formal education only up to primary level. This is a central issue to the background of the constraints confronting the firm. It seems that this contributes to lack of confidence and capacity to manage human relations within the enterprise as well as in managing external relations. It is observed in this study that the owner has difficulty in communicating with his personnel as well as in expressing himself on matters that are of concern to the firm. Personnel issues are handled haphazardly without clear procedures to handle the issues in an objective and transparent manner. Staff can be removed or changed without proper notification or without addressing critical issues, some of which cannot be solved by merely changing personnel or hiring new people. This situation has negative consequences on the performance of the business. The owner's lack of managerial acumen and overall capacity was exposed following the death of a key business trouble-shooter who was a senior employee and manager until late 1999.

## **Range of products manufactured and their growth over time**

Virtually all the products manufactured by the firm are not new inventions but copied from existing designs which are already available in the market. Very little, if any, new adaptations and innovations have been made on these products. This is partly because of lack of technical expertise and also because of the desire to keep costs down. This also sometimes culminates in the use of somewhat inferior raw materials compared to those widely used by other formal sector enterprises with a higher level of quality consciousness.

The firm has capacity to service and make alterations to existing metal fabrication installations, especially in the construction sector. Fencing material and fabricated walling material made from cement are new products that have been added to the list recently. The firm also produces exhaust silencers, a product not manufactured by many SMEs in the country, but which accounts for less than 10% of the revenue for the business. Most of the business is done on a contract basis and is customised.

For the size of the firm, the range of goods produced can be described as reasonable although there is nothing unique about them, except for the exhaust silencer pipes. The exhaust silencer pipe is a product that the firm has over the years managed to manufacture and requires a fair degree of technical expertise. The product is sold to the informal sector, especially those vehicle owners in the lower income bracket who cannot afford to buy the more expensively produced and higher priced components manufactured in the formal industrial sector. Although the business was



expanding into other product lines at the end of 2001, such as pre-cast security walls made from cement, it faces a serious management gap as a result of its lack of management dynamism. Considering that the enterprise is one of the oldest firms studied, an in-depth analysis of the firm shows that product innovation is low. The firm does not exhibit high learning capabilities to modify or make substantial changes to any of its products and services.

### **Production capability**

Most of the operations undertaken by the company require fairly basic welding and metal processing skills and not sophisticated processes. The company has over its lifetime acquired a few pieces of machinery and equipment. The core equipment includes at least four welding machines of various sizes, a medium sized compressor, welding generator and three gas bottles, small grinders and at least two drilling machines. The company also later acquired two used industrial cutters, one small sized and another one medium sized as well as an industrial fence making machine. The company has equipment and machinery with an estimated current value of approximately US\$45 000. However, the firm does not have major machinery and equipment like lathes, milling machines, bending machines and spot welders which are essential for more advanced operations in its line of business. The firm finds it too expensive to acquire more advanced technology which is usually demanded for more sophisticated operations and which requires a certain level of skills to operate. To overcome the problem, the company has access to the machinery through the equipment hire services of the Intermediate Technology Service Centre which is situated within close proximity. A typical example involves the hire of



Intermediate Technology machinery in the machining of gate wheels which have a high demand in the market. The reality though is that most of the firm's operations often tend to be restricted to simpler processes which do not demand sophisticated industrial equipment and machinery. For example, while the firm can develop in-house capacity to manufacture and install electric gates which demand a certain level of technical expertise and technological set up, including access to more advanced equipment, the potential has not been developed. The firm continues to prefer to manufacture the simpler manual security gates. Meanwhile the demand for electric gates continues to grow against the background of increasing insecurity felt by many potential customers.

Despite the fact that a number of the personnel employed by the firm have considerable experience in a similar industry, an analysis of the firm leads to the conclusion that the firm has low to average technological learning characteristics. The production operations and processes of Average Metal Fabricators are not highly knowledge intensive. The firm is neither technologically dynamic nor very innovative because the people running the enterprise are rather passive in managing the technological aspects of the business. The firm has not mastered deeper forms of knowledge, skill and experience required for generating continuous innovation in the form of incremental changes required to improve on the performance standards of existing technology.

### **Employee training**

The firm has both planned and ad hoc training of its personnel as well as externally linked technical training programmes with colleges. Both the

owner and the administrative assistant have been involved in several managerial and business development oriented training ventures over the past 5 years. The owner has been exposed to several small business development courses run by the private not-for profit agencies. Some of the training programmes include those mounted by the International Labour Organisation (ILO) 'Improve Your Business' and the Zimbabwe National Chamber of Commerce. The administrative assistant undertook a basic business studies and secretarial course by correspondence in 1997.

### **Quality management**

The quality of the firm's products is perceived to be satisfactory. This is evidenced by known feedback from at least 5 individual and institutional customers generated by the enterprise over the past 5 years. There are several repeat orders for jobs from large corporate customers like Zimbabwe Electricity Supply Authority, Barclays Bank Zimbabwe, City of Harare, Gabriel Real Estate as well as a number of building contractors and individual customers. A selected number of private individual home owners, including the researcher, who has since become a customer, are satisfied with the quality of metal fabrication products manufactured by the firm.

The firm has, however, no established quality management systems in place. Quality control issues are treated in an ad hoc manner with management, including the owner and supervisor who shoulders some responsibility on product quality. Whilst quality systems are not an area of strength for the enterprise, management perceives that quality issues are well taken care of within the firm. The firm is able to continue to sell virtually all of its products without any high level of product rejection. The fact that the



firm experiences satisfactory product acceptance in the market place with a specific number of customers may, however, be misleading. If the firm seeks to penetrate more discerning markets, quality management is bound to become an important issue. Good quality control systems are part of an overall operating characteristic feature of most dynamic and successful firms. Lack of sound strategies to deal with quality issues in a more systematic manner in view of perceived changing market demands over time could make the firm less competitive both now and in the future.

### **Firm's involvement in R & D**

The firm has little or no involvement in research and development, being mainly geared towards manufacturing of already tried and tested products. The firm has over the many years of its existence accumulated good technical knowledge to produce a limited range of products with little or no substantial modification to them. As stated earlier, no new products have been produced by the firm based on its own designs or research and development initiatives. The type of work done within the firm is somewhat unsophisticated, being executed by technical staff who can be described largely as 'semi-skilled' with assistance from unskilled personnel. The personnel composition which mainly comprises semi-skilled and unskilled staff with little or no advanced technical know-how explains to a large extent why there is no research and development being done within the enterprise. Moreover, there are no plans in place for any research and development work within the firm.



## **Level of productivity**

The productivity level within the enterprise is perceived to be very low with management concurring with that view. At the time the main study was first done during the second half of 2000, the analysis of the installed capacity at the enterprise in terms of available human resources showed that the firm utilised approximately 30% of its capacity. Factory workers are quite frequently idle or under-employed and the firm has excess personnel. When a good number of customer orders are secured, there is no evidence that the firm has operating systems that allow workers to execute their tasks in the most efficient manner.

Further follow-ups with the enterprise revealed that there has been a great deal of retrenchment at the business over a one year period with a view to addressing the problem of under-employment and productivity. However, the basic problem of how to enable the remaining personnel to become more efficient had not been addressed at the time further follow-ups were done. The issue of productivity also seems to be tied to the rather low-level incentives the business offers to its employees in terms of remuneration packages as well as other non-monetary incentives.

## **ANALYSIS OF NETWORKS**

### **Customer networks**

Average has over a decade managed to secure on a regular basis dozens of large institutional clients offering attractive job contracts. The customers include large corporate ones like the Zimbabwe Electricity Supply Authority (ZESA), Net One (a large telecommunication company spread all over the

country) and its affiliate companies, the Municipality of Harare, Barclays Bank, small to medium sized building contractors and several estate agents and individual householders.

Many of the customers, both institutional and individual were secured through the individual efforts of the now deceased former Production and Marketing Manager, Mr Chavu, who was a highly skilled entrepreneur able to communicate well with potential new clients and existing ones, providing them with value for money services. He had a remarkable capacity to generate new business in both the informal and formal market. A lot of the past success of the business was centred upon the man, who was the second founder member of Average although for reasons that are not altogether clear he remained an employee and not a shareholder of the firm.

The premature departure of Mr Chavu at the end of 1999 saw the business in decline both in terms of accessing new markets as well as in management of human relations both internally within the enterprise and externally with existing and new customers. The firm is more frequently failing to meet delivery deadlines than was the case previously, a situation which had become a common phenomenon at the time the case study was concluded during the last quarter of 2001. It seems that the firm has lost a considerable degree of trust and customer confidence that had been generated when Mr Chavu was still in the firm. The networks that were nurtured by Mr Chavu are therefore being weakened. An analysis of the firm's customers and level of business shows that business for the firm is in decline. However, although there could be other external factors to explain this, the evidence suggests



that a sizeable portion of the decline is associated with the current failure by the firm to manage customer relations.

Largely because of this failure, the marketing linkage capabilities of the enterprise have declined in recent years although the owner of the business is trying to sustain the marketing efforts by bringing in new personnel as well as taking over some of the functions himself. There is also an increasing dependency upon the advice of one of the owner's brothers, the aforementioned silent director, a Bulawayo based engineer employed by the Zimbabwe Electricity Supply Authority. The company has through the support of the silent director secured several contracts with this corporate organization, with one of the largest to date valued at about US\$12 000, which is a good contract for a small firm in local terms. The silent director also gives business management advice from time to time on an ad hoc basis and is having an increasing interest in the business as an 'informal consultant'. The benefits derived from the advice to date are difficult to assess as it was still new at the time of the investigation and may not have been translated into any tangible or visible gains. The general limitation of kinship-based relations of this kind was noted in Chapter 2. They may be good for coping, but not so good for learning within firms. What is clear from the owner's perspective is the growing interest to formalise and improve the operations of the business. However, no clear strategies seem to have been formulated and implemented in that direction at the time of the last visit to the firm.

An important issue in this case is management of customer networks, learning the demands of customers and acting to fulfil them by supplying



what is needed. Where customer trust and confidence become eroded, the potential benefits from the networks also fall. To note is the loss of trust which weakened networks that Mr Chavu had nurtured before his death.

### **Supplier networks**

The firm has a reasonable relationship with two major Harare based suppliers of raw materials. The association forged over a four-year period up to year 2000 has resulted in the enterprise securing 30-day credit facilities with the suppliers with a limit of up to US\$900 worth of materials at any given time.

Linkages with the suppliers providing credit facilities have in recent times been on the decline because of the inability of the company to meet payment deadlines properly. The loss of the aforementioned key member of staff who used to handle relations with suppliers has had a knock down effect on the firm as existing personnel are not able to keep up with high earlier standards of managing relations with suppliers, including timely payments.

The firm also buys materials like steel and metal products from other companies on a cash basis. No special relations involving accessing of credit facilities in sourcing raw materials have been forged with these suppliers, although the enterprise prefers to deal with certain input suppliers for both cash and credit purchases. This is because some suppliers are better stocked than others while price deals offered by various suppliers on similar items vary considerably.

The enterprise's relationships with suppliers of utilities and services such as electricity, water and telephones have deteriorated in recent months. Late payment and servicing of bills for utilities and other creditors has led to straining of relations with some providers of important services. The analysis of records at the firm shows that bills were not being paid to meet deadlines. The frequency of temporary disconnections of services like telephones has increased considerably as a result of late payment. This situation negatively impacts upon customers as well as the image of the business with consequent loss of business confidence, credibility and trust. The firm has little or no capacity to exploit suppliers for learning, nor can the existing relations with suppliers really be called networks.

### **Firm-to-firm networks**

Average can be described as having a satisfactory to fair level of relations with other SMEs operating locally. What seems evident though is that there is nothing really unique or special about the associations. This position is acknowledged by the management of the firm in discussions.

The enterprise is associated with another firm which is managed by one of the owner's cousins who is also engaged in metal fabrication but operating from another locality in Harare about 10 km away. The two enterprises share ideas on business strategies, quality improvement and other aspects of business management. Both enterprises have, however, not developed to the stage whereby they could be in a position to reciprocate any substantial financial assistance to each other because of their weak cash-flow positions and financial constraints. Besides sharing general business advice and information, it is not clear if this association has much contribution to



learning between the two enterprises and seems to have the same limitations as kinship networks in general.

Average is informally and loosely associated with three other local enterprises owned by friends and business associates with which business ideas and some raw materials and other inputs are occasionally shared. If one of the entrepreneurs within the informal association is in need of any inputs or support which can be provided by others, any of the entrepreneurs can be approached to bail out the distressed entrepreneur. The borrower and the lender reach a verbal understanding regarding repayment which is often done within one month or a few weeks. In most cases the informal 'gentleman's' agreement is usually honoured without difficulty.

This arrangement does not have any written rules and is done in a friendly and informal manner and only when the need arises. It is conducted in an ad hoc manner to overcome specific short-term situations of distress. This occurs without any specific pattern but as often as necessary which ranges from once a month up to several times a month. When Average becomes stressed financially, the owner often approaches any one of the three, or if need be, other entrepreneurs who may not be 'core members' of the undeclared informal association. Resources amounting roughly to an equivalent of US\$100 can be exchanged at any one time within a reciprocal relationship context. The frequency with which resources are shared in this network is variable and also depends on whether the potential lender has the resources in demand at the time when the potential borrower comes forward with a request. While this association is a good coping and survival network, its direct contribution towards learning is not evident.



The firm does, however, acquire new ideas from other firms infrequently. Two examples can be cited. The first is a project initiated during the year 2000 relating to the manufacture of wall panels. Within a few months of operation, the project was employing almost the same number of personnel as the metal fabrication business line. The other one is the fence-making business line which was facilitated by the acquisition of a second-hand fence making machine.

Besides adopting new business ideas in terms of moving into product lines which other entrepreneurs are already involved in with a view to improving business viability through diversification, learning induced by inter-firm networks seems to be limited. There is not much evidence of incremental learning from the networks which assists to strengthen the production processes and management within the enterprise. Average has in the past recruited some production personnel with prior industrial experience in similar business in order to improve its technical capacity. However, the firm is not acquiring deeper forms of knowledge, technical and non-technical skills from other firms besides what seem like fairly basic ideas or generalised forms of knowledge.

It is also clear from the analysis that, outside of these informal linkages, formal linkages with other firms are quite limited. No such traceable linkages are identified. The reasons why the linkages tend to be weak is a result of several factors which have emerged from a series of discussions held with the firm's management. Some of the major reasons given or identified are as follows:

- There is no perceived need for stronger linkages between the firm and other firms from the perspective of management;
- There is lack of confidence and trust by management to expose the firm to a larger number of firms through more intense relations and communication, and;
- There is also a lack of capacity to learn and to forge sustained relations with a view to achieving specific improvement targets.

Thus, firm-to-firm networks demonstrated by the enterprise are informal and/or kinship based. They are oriented more towards coping and survivalist needs than learning. Learning acquired through these types of networks seem to be confined to basic needs and not higher level forms of learning. Through these networks the firm does acquire some new product ideas which essentially involves copying what other firms do and how to produce specific products. The firm then recruits personnel with basic skills to produce the products. No major changes are made to the products. As indicated in the case study, learning which is triggered by firm-to-firm networks seems to level off at fairly basic levels – with acquisition of fairly basic generalised forms of knowledge.

### **Enterprise support networks**

The firm is well networked with private sector supported small business oriented training programmes. Many personnel from the programmes have expressed interest in providing support to the enterprise, support which is often not forthcoming to most similar enterprises in the country. The firm has a major link with the Small Business Unit of Barclays Bank, which not only



seeks to finance small businesses but also facilitates training in various business management aspects. Relations with Barclays Bank began in 1996 when the firm through its owner participated in the business management training programme – IMAGO. In 1998 the firm participated in a Barclays Bank associated Tobacco Leaf Small Business Programme, winning 3<sup>rd</sup> prize accompanied by a cheque of approximately US\$700, a reasonable amount for a small business at the time. In 1999 the firm participated in an International Labour Organisation (ILO) 'Improve Your Business' Training Programme, through a 5-day training seminar. From 1995 the firm was also, through its senior management, involved in the ZNCC business training courses which covered issues such as (a) How to start and run a small business, (b) Accounting and (c) Public relations. The ZNCC has to date provided considerable support to the enterprise, especially the owner, providing relevant and useful business management training.

Linkages with ESOs seem to be satisfactory, therefore, but there is room for improvement. The business has some linkages with the locally based Intermediate Technology Business Service Centre through which some equipment and machinery like lathes, milling machines and spot welders needed by the firm for certain processes can be hired. At the time of visiting the firm, Average indicated that the firm was only very occasionally doing so. Because the firm has over time managed to acquire much of the basic equipment and machinery it needs for its production process, its relationship with Intermediate Technology was minimal. Moreover, the firm is not intensely engaged in processes requiring sophisticated equipment. The firm also has some linkages with a number of vocational technical colleges from



which trained manpower are provided as required. The enterprise has plans to replace a number of its existing experienced technical personnel with 3<sup>rd</sup> and 4<sup>th</sup> year college students who are to be paid lower remuneration than the existing staff. The rationale for this is what seems like an ill-advised plan after the owner of the firm who, despite good exposure to training programmes, failed to manage staff properly and their apparently legitimate labour demands. The decline in staff motivation and industrial relations occurred soon after the death of Mr Chavu, a man who among other things was skilful in minimizing personnel related conflicts because of his management style which fostered open communication and dialogue with staff.

Despite being exposed to many technology development oriented networks, the firm may not have benefited greatly from the networks through substantially enhancing its technological learning as would have been expected. Ideally, the existing networks should have gone a long way in strengthening the technological learning within the firm and the general management of the enterprise but the reality is that this has not happened to any significant extent. The enterprise lacks capacity to learn and has a weak institutional memory due to the limited educational background of the owner and management. There is thus little association, it can be argued, between enterprise support networks and learning in this case. Tangible potential benefits from what is learnt through the various networks in the form of training programmes and capacity building schemes the enterprise is exposed to, principally through its owner and other senior staff over the years, are not evident. The limited progress within the enterprise in this area

is also due to lack of strategic business leadership and guidance which in turn results in the firm failing to achieve high levels of competitiveness within an increasingly complex business environment.

Outside mainstream ESOs, a number of business development services do play an important part in the development of the enterprise. The firm, in the past few years, through the linkages established with the Small Business Unit of Barclays Bank, obtained approval to operate a modest overdraft facility of an equivalent of US\$700, which was later updated to an equivalent of US\$1 800 (where the owner's brother, the 'silent director', played an influential role – see below). This reflects some measure of confidence and trust by the bank in the management of the enterprise. The firm combines the available funds from the commercial bank overdraft with its own resources as well as some supplier credit to gain easier access to raw materials. The funds available from the firm's own savings are perceived by management as insufficient to meet the firm's operational needs fully, especially in financing large contracts which require substantial volumes of raw materials (and where there are no down payments from the customers – see above).

In the case of Average, networking can be said to have to some extent strengthened the firm's investment capability. It may also be said that within the enterprise, there is some degree of learning, albeit limited, which can be attributed to networking. It is also noted that much of the networking leadership within the enterprise was previously done by the deceased member of the firm, Mr Chavu. Although it would be difficult to quantify it, the entrepreneur must have learnt something through his interaction with Mr



Chavu over many years. This may actually be the reason for turning more and more to the silent director (see below). The motive for this seems to be mainly to fill in the gap created in the absence of Mr Chavu, even though on an ad hoc basis and in a fairly limited way.

### **The relationship with the owner's brother**

A special note is needed in this case study on the relationship of the owner with his brother, the 'silent director', I have noted above that the brother facilitated upward revision of the firm's overdraft facility with Barclays Bank. The silent director facilitated the owner to visit the bank, and jointly participated in and led negotiations with bank management that resulted in obtaining support. This facilitation of linkages with a major financial institution has had a positive outcome to the company which later had its overdraft facility increased as the bank became satisfied that all the relevant systems and papers were in place to monitor the performance of the enterprise. In particular, the bank needed to be satisfied that the customer would be able to service the overdraft facility well, ensuring that payments are made on schedule. The silent director applied his negotiation skills to build the necessary trust and confidence with Barclays Bank which eventually led to the successful outcome. In this case an informal kinship relationship has been used to strengthen a formal network with the commercial bank to the benefit of the firm.

There is something to learn about managing relations between firms and finance houses in this case. Having realized his own shortcomings as far as his capacity to dialogue with Barclays Bank is concerned, the business owner sought a network broker to assist him present his case to the bank.



In this particular case, his more educated brother played the role of a broker, exploiting his position as a silent director to gain the support of the bank for the firm. The principal owner of the enterprise knew quite well that such support would not have been forthcoming without a well presented case to the bank. The broker played his role well and the bank responded positively to the request by Average. It can thus be concluded that in cases where capacity to network does not exist within an enterprise, network brokers or facilitators can be useful in bridging the gap. The cost of engaging network brokers, either formally or informally is however, not fully known. There is also need to explore whether this approach can be adopted as the best practice for SMEs. There may also be barriers to engaging formal brokers as this may tend to expose enterprises unduly to unscrupulous people. For valid reasons, many entrepreneurs may not want their businesses exposed to outsiders. Only in cases where a reasonable level of trust exists or is generated is such exposure normally allowed.

A number of questions can be posed with respect to this relationship of the owner with his silent partner. The first question relates to how to sustain a kinship based network where the benefits derived by the second party to the network, in this case the benefits accruing to the silent director, are not clearly defined. It is also not clear whether there is an undeclared payment in kind involved in this network. The researcher understands that the silent director who assists the business on various issues on an ad hoc basis is doing it entirely for free. In the event of a more long-term and continuous involvement in the enterprise, it is not clear how the second party to this network would benefit from the involvement. It is not usual for someone to

commit a considerable amount of time providing inputs to any business for no benefit on a sustained basis. A greater and continuous involvement of the second party possibly means taking a more significant role and function in the business which could in the end take away some of the authority of the owner and possibly result in the restructuring of the organisation. Though such a development potentially could benefit the business, it is not evident that it would be welcomed by the owner who might regard it as an intrusion. Another question is, to what extent is it possible to formalize the informal network if it is deemed necessary by both parties? Is it possible to develop the informal network into a more structured relationship with clearer roles and functions and clarity of benefits to the second party to the network? A lot would depend on how far the second party is prepared to go in terms of involvement in the business and whether his support based on goodwill can be sustained. Two options can be considered within the context of this network.

The first option, possibly the most likely scenario, is that the relationship could continue for some time in its current form with the second party not openly declaring his full interest in the enterprise but simply acting 'in support of his brother's business'. In this case the mechanism of reciprocating this gesture either through one form of payment or another by the principal owner, possibly in-kind payment, needs to be considered since this can contribute towards the strengthening of the relationship. However, in the event of non-reciprocity, which is also quite possible in the given circumstances, the relationship could just remain static, drift along or even be terminated. There is a possibility that the informal network has a potential



of simply collapsing as demands upon the second party increase and become unsustainable or unbearable, especially against the background of unclear benefits. The second possibility, a not so remote one, is that the network could evolve into a more structured arrangement where the second party might be able to take up some senior management responsibilities in the business in a more formal way. This would mean restructuring of the firm, redefinition of roles, with the second party taking an executive directorship in the firm. This second possibility seems unlikely as the principal owner does not seem to be predisposed to allow any major changes to the ownership and shareholding of the enterprise. Nor could it be verified if the second party is really keen to join the business on a formal basis. The analysis of the enterprise, however, reveals that major changes to the firm, especially to management, may actually enhance technological learning for the firm. This of course would depend on the direction of change.

### **Concluding remarks with respect to Average Metal Fabricators**

The Average case study illustrates a number of points. Firstly, although networks embodied in specific people are useful, they are difficult to institutionalise and can become quite fragile. This is illustrated by the decline in various kinds of network when a key member of Average Metal Fabricators, Mr Chavu died. Secondly, it is important to distinguish different kinds of network. A network that is important for survival may not help learning and vice versa. Thirdly the dynamics of the technological learning-network relationship needs to be adequately understood. There seems to be the possibility of a virtuous circle of Networks enabling Learning and vice



versa, but equally there might be a vicious circle depending on basic capacities within enterprises.

From the foregoing analysis, the enterprise's technological learning characteristics are lower than might be expected from its comparatively high networking qualities, implying that the firm is unable to derive a great deal of benefits from its existing networks. Despite all the training given to the entrepreneur and some of his personnel over the years, low capacity to learn within the firm has scaled down the accumulation of both technical and non-technical knowledge essential for a dynamic and successful enterprise. Average is possibly one of only a few SMEs that does enjoy good relations with various enterprise training programmes offered by ESOs over a considerable period. There is no evidence, however, that the training provided has yielded high benefits by enhancing the enterprise's technological learning in any significant manner. The major constraint is to do with lack of dynamism within the enterprise, poor management, housekeeping and communication which reflect the weaknesses of the owner of the business more than those of employed staff. In this case, the owner seems to be the major bottleneck to progress in technological learning in the firm. Informal discussions with some of the personnel of the firm, verified by observations of the actions and behaviour of the workers and management, seem to indicate that morale is low. Discussions with the owner of the firm confirm this understanding although the reasons given for the situation are different from those provided by the firm's personnel. Staff turnover is also in recent years reported by management to be quite high

which is another indicator of failure to manage staff relations and lack of motivation.

Related to this major constraint, two further points can be made. Firstly, the firm has weak capacity to learn and networking has not therefore had a major impact upon technological learning in the firm. What emerges from this case, therefore, is that networks by themselves are insufficient: in-house capacity to learn technologically is critical if networking is to benefit enterprises like Average. In this way Average qualifies the research hypothesis. Secondly, at the time of the research the networks were in decline, anyway. This illustrates that networks depend ultimately on people who can both maintain them and the bases of trust on which they are predicated.

**6.4 A Case Study of Informal Welders**

***Classification:** Poor networker with correspondingly poor level of technological learning characteristics. Reflects low level of dynamism both in terms of technological learning as well as networking qualities*

**Background**

This is an informal cooperative welding business based in Mbare Home Industries, Koffman Area. The enterprise operates from an open space. It



constitutes a loose cooperative association of 6 related persons headed by Mr Informal (65 years) who is the founder and leader of the cooperative. The cooperative is divided into production units made up of two persons. Each production team handles its own operations, from raw material procurement to marketing. However, members of the cooperative often assist one another at all levels, from production to marketing, operating within a friendly atmosphere.

Mike (29 years) and Denis (27 years) are two former school leavers whose welding activities are at the centre of the informal enterprise which also enjoys a loose connection with neighbouring enterprises run by distant relatives. The two ventured into metal fabrication after failing to secure formal employment. The business was established in 1992 through personal savings of an equivalent of US\$260. Mike and Denis had no previous experience in the business but learnt on the job with on the job training provided by Mr Informal the senior. Both Mike and Denis are secondary school leavers who failed to progress beyond Ordinary Level. The two started off welding activities in 1992, initially receiving informal exposure at the Koffman plot where they are currently working. After generating some confidence through on-the-job training, they established their venture, which they are running as part of the larger cooperative business. The kinship relations of the cooperative help keep members together since they know each other quite well from relations established outside the enterprise.

The core business of the enterprise is to produce scotch-carts, which constitute at least 50% of sales revenue at any given time. The other 50% of



revenue comprises sale of door frames, window frames, security and other wrought iron works as demanded by customers.

Informal Welders have not been spared by the harsh economic environment which saw the viability in most enterprises both large and small declining markedly especially from the period 1999, worsening in the subsequent two years, especially from the second quarter of 2000 through to 2001. The volume of business handled over the past three years is on the decline as the customer base fell with the falling real wages in the country.

### **Organisational structure and human resources situation**

The enterprise has a loose organisational structure with no clearly defined roles. Members of the kinship-based owner-operated cooperative business are equal in the manner in which they execute management roles and responsibilities. Because of the low scale of operation and level of informality of the enterprise, business operations are functionally-managed and not line-managed.

### **Range of products manufactured and their growth over time**

Product range for the business is restricted to ox-drawn scotch-carts (the major product) and other wrought iron items like door frames, window frames, security screens and various miscellaneous metal goods. Occasionally, sheet metal and steel rods of different sizes and type can be cut to the specification of the customer. The range of products has remained somewhat static over the past 10 years.

The major factors that account for the low growth of number of products manufactured over time are various. In the first instance the enterprise was

started off by the two owners as a last resort after failing to obtain employment in the formal sector. The entry point of the business is informal, with very limited capital, equipment and machinery, technical knowledge and business management expertise. No additional financial or technical services support has ever been sourced from formal sources to date. The enterprise remains static in terms of growth of output, technological learning and other key characteristics, for example, number of people employed. Prospects for growth and expansion of product range are limited unless something which is quite unlikely happens, an action that entails a complete revamp of the business and production management of the enterprise.

### **Production capability**

Informal Welders uses basic production methods, depending a great deal on manual methods and hand operated equipment and tools. The main production technology in use is the welding machine, the major piece of equipment in the manufacture of scotch-carts, door frames, window frames and associated metal fabricated goods. The enterprise does not use more advanced machinery like lathes, grinders and pressing machines.

Technical knowledge is restricted to that which has been acquired informally through on-the-job training over several years. The owners do not perceive the need to improve technical and production capacity of the enterprise through training or skills upgrading and or acquisition of new technology. This is partly due to the fact that this is an enterprise which can be classified in the 'low growth potential' category. The aspirations of the entrepreneurs in terms of what can be achieved are also not surprisingly very limited.



The enterprise is, however, capable of producing a maximum of 4 standard ox-drawn scotch-carts per week, as well as an assortment of other small metal fabrication goods. This depends on the number of support personnel involved in the production process and also upon the timeliness of availability of raw materials.

### **Employee training**

The enterprise has no employee training scheme in place, whether planned or unplanned. There is no in-house staff training within the enterprise. Personnel training is not a priority issue for the enterprise which depends upon fairly basic production management skills of the owners who are basically self-employed.

The owners of the enterprise are school drop-outs who had not been exposed to any formal tertiary training both before business start-up and after the business was established. The entrepreneurs are only exposed to some technical mentoring on the job. While some mentoring is useful to the operators of this enterprise to enable them to generate some livelihood, it is evident that whatever skills the owners have acquired on the job, whether technical and non-technical, seem only to be applicable to a non formal business with low growth potential. The skills acquired are too basic and not sufficient for a dynamic enterprise producing a high quality range of products on a competitive basis for a more discerning market.

### **Quality management**

The enterprise has no quality control mechanism in place. There are no personnel whose primary responsibility is to manage quality issues. For the



products manufactured by the enterprise, the general perception of enterprise owners as well as from the researcher's own observations over several visits to the business is that product quality is low. Quality management systems are non-existent. Product finishing is perceived by the more discerning customers to be quite poor with the quality of finished products being low. The only quality checks that exist involve ad hoc visual inspections of the final product by the producers. These checks usually do not result in major changes to the quality of the product, except for minor changes in the event that some problems are identified after items are produced. It is also noted that the business caters mainly for the lower income market segment, the less discerning poor income groups that are rural based and require cheap products which do not necessarily conform to any high quality standards.

To the extent that the enterprise seems to be under no pressure from its main customers to address quality issues, and that as long as the firm maintains the existing low level of production, there is no pressure upon the enterprise to address quality issues as a priority issue. Such a position seems quite rational given the informal nature of the business, its scale of production and small size. Only when the enterprise owners decide to tackle more discerning and demanding customers of higher income earners and institutional customers would quality management become a major issue. The analysis leads to the conclusion that quality issues are closely related to marketing and customer issues. Poor customer networks (see below) are thus related to the low technological status of the enterprise.

This observation accords with the corollary conclusion of chapter 5 that, of the different networks studied, those with customers are generally the most important for technological learning.

### **Firm's involvement in R & D**

The enterprise does not have an in-house research and development capability whatsoever. The entrepreneurs copy existing product designs for all the products they manufacture. The firm does not have basic resources in the form of skills, technical and managerial capacity, finance and other materials required to engage in innovation oriented activities like design manufacture and other demanding engineering tasks. The open air premises from which the firm operates are not conducive to any significant form of research and development. There is neither any capacity nor any plans within the enterprise to carry out research and development activities now nor in the foreseeable future. In view of the fact that the enterprise manufactures principally for the low income market segment which is less demanding in terms of innovation, it can safely be concluded that research and development activities do not fit into the scheme of things of this non-formal enterprise. This is also the case in view of the rather limited production capability the firm has which in turn is confirmed by the basic methods of production the enterprise depends upon.

### **Level of productivity**

Given the limited productive capacity of the enterprise and its available resources, an assessment based upon on-site observations, it is concluded that the productivity of the firm is quite low, a characteristic feature of most



non-formal enterprises operating in the same sector. The entrepreneurs running the business seem to have resigned themselves to low productivity. The ability of the enterprise owners to manage change and to adapt to new technical challenges with a view to improving productivity is also poor. There is no productivity improvement plan in place. The production process is managed on an ad hoc basis without any reference to any particular production strategy or efficiency criteria, whether implicit or explicit.

The enterprise has limited access to key resources that include finance to execute large orders, and inadequate technical and managerial skills to manage the production process for higher level productivity. For a non-formal enterprise of the status of this firm, in terms of productivity this may not be a surprise. Such issues normally relate to high growth formal SMEs and other larger firms with considerable resources at their disposal and targeting the more sophisticated high-income market segment. It would seem therefore that there is a circular relationship between the type of customers or market being serviced and the extent to which a firm can undertake productivity improvement activities. This is the case despite the existence of a host of factors that influence the productivity of firms.

## **ANALYSIS OF NETWORKS**

### **Customer networks**

The major customer base for Informal Welders largely comprises passer-by customers who are quite often variable and unpredictable. Because of the proximity of the enterprise to a major bus terminus which links Harare to a large number of rural and peri-urban centres, there is potential that the



regular rural and peri-urban buyers may become a foundation of a network. However, the business has no serious marketing strategy in place and does not in any way actively seek new customers. There is low capacity within the enterprise to undertake customer oriented initiatives. Despite marketing being a problem area, judging by the manner the business relates with its customers, the owners do not seem to perceive that there is any need to improve marketing capabilities. This situation further reinforces the informal nature of the enterprise and its failure to grow in size over more than 8 years of operation. There is a relationship between low level of entrepreneurship within the firm, low production capacity and poor marketing capabilities. General business management and entrepreneurship development are areas of weakness for the enterprise. There are no written business records to assist in the monitoring of the business. Such an analysis might help inform any future strategies of handling customers with a view to establishing a network which might have something useful in terms of learning for the enterprise.

### **Supplier networks**

Informal Welders does not have any well defined links with input suppliers. All raw materials used by the enterprise are acquired on a cash basis. However, only small quantities are bought at a time. There is no supplier credit and there has not been any attempt to secure it. Given the way the enterprise operates and is organised, it is also quite clear that it would not qualify for any supplier credit since this facility is ordinarily granted to more structured formal businesses with a good track record of dealing with specific suppliers on a regular basis. The securing of supplier credit also

demands marketing confidence and generation of business credibility, some negotiation skills and trust. Within the realm of formalised enterprises within which supplier credit is often granted, it is usually regarded as very risky by suppliers to sell raw materials on credit to enterprises in the category of Informal Welders. The enterprises are generally misunderstood, they are perceived to have dubious legal standing and have no traceable business records to demonstrate that their business is worthy of being taken seriously by any suppliers of inputs. They also buy small quantities of raw materials at a time on an ad hoc basis. Their volume of business in any given period, for example within a month, is quite unpredictable and difficult to monitor.

In order to secure raw materials supplies, the enterprise depends largely on its own very limited resources as well as borrowing from the informal market which basically involves a network of relatives and associates who are involved in other SME enterprises in the surrounding area. The enterprise has very limited cash outlays and depends on advance payments by customers, especially those who make large orders which cannot be executed through the use of the limited in-house financial resources. Often customers of larger items like scotch-carts are asked to pay up to 50% down-payment for orders before items are produced. Only very limited quantities of the small range of products are on display for customers. Informal Welders is unable to execute large volumes of business where advance payments of cash cannot be secured from prospective customers because the enterprise faces cash-flow constraints. Through existing kinship associations the enterprise is unable to mobilize large amounts of cash to buy and stock raw materials because the money is simply not



available from that source. This points to the difficulty non-formal enterprises like Informal face in relying on informal kinship associations. For several years, the enterprise has, like many in its category, levelled off at production levels which are below full potential in terms of output and productivity.

### **Firm-to-firm networks**

The enterprise has rather weak linkages with other SMEs as well as with larger firms outside the network of relatives that the business owners work with. However, the firm often buys small components and accessory items for the products that it makes from other locally based SMEs and other suppliers. The business does not have sufficient capacity to produce the intermediate capital goods by itself. It sees its relationship with other locally based enterprises as being good enough that it has never failed to obtain any essential items or components needed for its manufacturing activities.

As a survival strategy, against a background of a hostile macro-economic environment and dwindling market, members of the enterprise are increasingly seizing any business opportunities involving the supply of products and services which are not their core business. There seems to exist a loose alliance with certain other enterprises in and around the operational area to act as brokers for goods supplied by other firms. For example, if any potential customers come looking for particular items supplied by other surrounding small businesses, members of Informal Welders endeavour to link the potential customers with those businesses. There is often a friendship association among the businesses. The buyer does not have personally to visit the enterprise with the required items. For



example, members of the enterprise cooperate with other surrounding enterprises to provide customers with customized steel and metal fabrication products and services. The sourcing of required materials from established suppliers or manufacturers can be arranged through the firm. There are cases where items like full lengths of metal sheets, steel rods of various types and sizes are acquired by members of the enterprise from other firms within easy reach, cut into different sizes as per customer specification. All the three parties in this cooperation arrangement benefit. The customers receive the products and services they require at competitive prices and quickly. The firms from which materials are sourced increase their incomes from more sales. Members of Informal Welders generate more income from top-slicing, which increases their profitability from their activities of sourcing required materials and the further value added tasks of cutting and customizing products.

### **Enterprise support networks**

There is no evidence of any form of business or technological support services being availed to the enterprise, whether directly or indirectly. No serious efforts have been made by the owners of the business to solicit such services from available service providers at any time during the life of the enterprise. There is neither any perceived need for more advanced technological inputs nor for any additional formal technical training, skills upgrading or business management training. These inputs or services have not been provided to any of the entrepreneurs in the business in the past. No plans are in place to obtain such services in the foreseeable future.

The entrepreneurs have very low aspirations and no vision to grow their enterprise. They are very much inward looking. There seems to be a belief within the enterprise that what is already known relating to technical or non-technical matters is adequate for the time being. Because of their socio-economic status and limited technical and business knowledge, there is a low level or lack of confidence to enter the formal business world with a view to establishing a more dynamic and up-market focused enterprise.

### **An elaboration of networks within the context of kinship relations**

Because of the informal characteristic of this enterprise, informal kinship networks play a special role that is much more distinct than in the other three firms. These networks are based on a high level of characteristic-based or ascribed trust (see chapter 2, section 2.3.2). Quite often members of this kinship group take leave of absence from the business to go and attend to various private affairs leaving other members within the informal network in charge. The members left in charge of the business often assist with the selling (within the enterprise location) of items belonging to those members who are absent. The items sold can be jointly owned. In other cases, ownership may be limited to one individual member of the group. In this respect there is considerable flexibility in that members of the network are able to exploit their potential in marketing any other products or services which may or may not be associated with their core business. Members of the enterprise have a practice of cooperating when such items or services are provided to customers and the entrepreneurs involved usually share the financial proceeds in proportion to their degree of involvement. Although this



kind of network is a good coping mechanism, its contribution to technological learning seems very low or at the least unclear.

What joins the entrepreneurs together is a high element of trust based on the fact that the entrepreneurs are related, share the same ethnic background and come from the same region. Both Denis and Mike contend that they would not have started the business without the kinship relationship with the elder member who facilitated the establishment of the metal fabrication business which also operates within the same plot. The elder member whose own metal fabrication work has declined with age is still playing an influential role, providing some business ideas and support to the enterprise which is now being run by the younger generation of entrepreneurs who are part of the cooperative association.

The situation with respect to the role of informal networks, in particular kinship relationships seem to be unique for informal sector oriented enterprises like Informal Welders and is less of a feature with respect to other more formally constituted enterprises studied. This demonstrates that informal networks are more important for smaller non-formal enterprises than they are for the larger formal sector enterprises. The latter depend on more institutionalised kinds of networks than those upon which the former depend on.

In this case, kinship networks are demonstrated to be important for acquisition of basic production and business skills. They are important in bringing on board new members who would otherwise be unable to start businesses on their own. Kinship networks of this kind assist to swell the



numbers of micro-scale enterprises such as Informal, whose size or scale of operation, however, remain static over a long time.

The high level of trust is an undoubted strength for this firm. The downside is that its base in kinship relations means that the vision and aspirations of the owners of the enterprise are quite low because of the socio-economic milieu in which they are trapped. The owners do not see themselves breaking out of the informal sector production system, at least in the foreseeable future. There is no strategy to expand the enterprise to become more formal and dynamic. Technological learning tends to be limited to that which is already acquired informally with no interest or strategy to up-grade technical or business management skills. Networking with business development services of various sorts is low to non-existent. Documentation of activities, which includes keeping of basic records and accounts is extremely poor. The low levels of education of the owners of the enterprise seem to be a big factor that exacerbates this situation.

### **Concluding remarks with respect to Informal Welders**

This is a coping network largely geared to basic survivalist needs and not so much a learning network. The scale of operation is quite low and does not demand much learning as part of a strategy of coping with new business challenges. Regarding the learning process, once basic production capacities are acquired, the tendency at Informal has been to level off at the basic levels. There is little or low capacity to generate new knowledge, no acquisition of new capacities and a drought of innovative ideas. The enterprise is also characterised by low productivity generally.

It is clear from the analysis of Informal that non-formal networks may be important for survival but they do not contribute substantially to technological learning. The capacity of the enterprise to influence learning or to acquire new knowledge as an on-going activity is low as demonstrated by the lack of an active search for new knowledge. Within the enterprise and in the context of the non-formal type of network described, there is lack of pressure to learn.

## **6.5 Concluding remarks to Chapter 6**

The case studies in this chapter confirm the thesis hypothesis in a broad sense, but also qualify it. The findings here also confirm those of chapter 5 that good customer networks are of paramount importance to technological learning among light engineering enterprises in Zimbabwe, and that firm-to-firm networks are not so important. Another finding from chapter 5 – that enterprise support organisation networks do little to foster technological learning – is, however, qualified by this chapter.

With respect to customer networks, it is clear that the basis of these has to be trust that is earned through good business practice of meeting deadlines and quality norms, and of giving value for money. Then all kinds of ideas can flow for improving quality and other production processes, and for product adaptations. Dynamic and Classic illustrate this well.

Conversely, there is a pervasive sense of absence of trust when it comes to forming relations with peer firms and a corresponding fear of opportunistic action. Where there are exceptions it is where the basis of trust is high for



other reasons. These are firm-to-firm networks that are also kinship networks where there is a high level of ascribed trust, such as the networks of which Informal Welders, and to some extent Average Metal Fabricators, are part. Such networks seem good for firm survival strategies, but less good at fostering technological learning (see chapter 2).

Turning to enterprise support organisations, of the case study firms in this chapter, Informal has no such relations and Average has well-developed relations but seems unable to mobilize them for technological learning. Two firms, Dynamic and Classic, are, however, able to exploit good relations with ESOs for both process and product innovation.

The analysis of Average and Informal suggest that firms need capacity to learn and also exhibit associated entrepreneurial and management skills. If they do not exhibit these qualities – and capacity includes motivation and a pro-active stance – the networks will not deliver effective technological learning. If they do exhibit these qualities – as with Dynamic and Classic -- one can envisage the possibility of a virtuous circle between networking and technological learning where both feed each other.

Finally, the case study of Classic demonstrates that a firm with a high learning capacity, and which sees itself as knowledge-based, does not necessarily need a proliferation of networks. It strategically chooses them as one element of enhancing the firm's knowledge base (another element in the Classic case study is the internet), and chooses them carefully.



The next chapter provides conclusions and recommendations drawn from a combination of analysis of case study results and the analysis of structured survey data.

## **CHAPTER 7: CONCLUSIONS AND RECOMMENDATIONS**

### **7.0 Conclusions**

This chapter presents the main conclusions from the research, drawn from two types of analysis namely:

- Survey data which are both quantitative and qualitative; and
- Case study analysis of four firms with different characteristics.

### **7.1 Broad conclusion**

The research generally lends support to the hypothesis that:

‘Networking is important for technological learning within firms. Small and medium scale light engineering firms that are strongly networked exhibit a greater level of technological learning than poorly networked firms.’

The support for the hypothesis is contained in the statistical analysis of chapter 5. In both aggregated and disaggregated form there are significant correlations between technological learning and networking indices. The case studies of Chapter 6 provide further support in that they demonstrate the link between strongly networked firms and technological learning. The hypothesis specifies a Zimbabwean context, but the results also lend support to more generalised arguments of Mytelka (1997) and Best (1998), referred to in chapter 2, that certain learning benefits can be derived by enterprises from networks. However, there are a number of qualifiers to the hypothesis since several important issues also emerge.

What follows are the main specific qualifiers and conclusions that emanate from the study:

- Knowing how to learn is important for firms to derive benefits from networks.
- Managerial skills and entrepreneurship are key to learning.
- All networks are significant, but some kinds of network appear to be more significant than others:

Customer networks are consistently very important;

Supplier networks have a less direct effect than customer networks on technological learning but are important for maintaining a secure environment (security of supplies) in which learning can take place;

Weak supply response by Enterprise Support Organisations (ESOs) makes their inputs ineffective, and

Firm-to-firm networks do not feature so strongly among the SMEs studied.

- Although a 'package of networks' is needed by firms, not only because of the observed interdependence between networks, which tend to reinforce each other, not all networks provide important flows of knowledge to firms at a given point in time. The 'package', therefore, has to be viewed dynamically.
- The most dynamic technological learners show evidence of moving from process to product improvements.



It must be noted, however, that these qualifiers and conclusions often overlap and are inter-related. For example, management skills and entrepreneurship are related to knowing how to learn.

## **7.2 Development of capacity to learn – knowing how to learn is important for firms to derive benefits from networks**

A prior capacity to learn by the enterprises is important if networking is to have a positive impact on technological learning. The case studies of chapter 6 demonstrate this. Firms that can be characterized as successful learners are those run by entrepreneurs with a traceable record of acquiring knowledge in old networks associated with the entrepreneurs before the enterprises were formed or acquired. The tacit knowledge of entrepreneurs and senior employees which develops over time through exposure and interactions in related and associated industries plays an important part in the ability of enterprises to acquire new knowledge currently.

It is shown in this study that firms with high technological capability have high capacity to learn technologically. There is thus a circular relationship between technological capability and learning. But the question is how in the first instance do the firms acquire the technological capabilities which strengthen their ability to become better technological learners. This introduces the issue of existence of basic capacities – some level of technical and management skills, some degree of entrepreneurship, motivation to learn, innovativeness and communication skills. Basic qualities are acquired through educational and tertiary training systems early on in the

entrepreneurs' lives. These qualities are later consolidated and further developed over time through; (a) hands on experience in other firms; (b) further training on-the job; and (c) awareness building which is done in various ways within the firms and outside.

It is argued that much of these qualities are built and strengthened through networking which takes place over a fairly long time, for instance, while the entrepreneurs are employees in other firms (before they even establish their own enterprises), and after they establish their own business undertakings. Over time enterprises can acquire learning skills to different extents depending upon the backgrounds of those who run them.

The extent to which the process of learning how to learn takes place over time for the key actors in the firms is a major influence on the relationship between technological learning and networking. A great deal of learning can indeed take place as an on-going process but a lot depends on basic human capacities within firms.

It is hence concluded in this study that networks by themselves are insufficient, in-house capacity to learn technologically is critical for learning to take place.

### **7.3 Managerial skills and entrepreneurship are key to learning**

From the analysis of case study firms, it can be concluded that management skills and the level of entrepreneurship within firms, especially as these pertain to the owners, are key determinants of the extent to which firms



network and use these networks for technological learning<sup>1</sup>. Entrepreneurs who are dynamic and innovation oriented are able to participate actively in a variety of networks that are useful to learning. Added to this, the ability of entrepreneurs to put together dynamic teams, which are outward going and are willing and able to accumulate new knowledge is important. The ability of the firms to learn through networking depends a great deal on the calibre of human resources within firms, an issue over which entrepreneurs have a major control.

The case studies of Classic and Dynamic discussed in chapter 6 illustrate the above points well. The entrepreneurial drive, motivation and innovativeness of the owners have played a critical role in the way networks have been exploited for the benefit of learning within the enterprises. In particular, the owner of Classic targets networks strategically that he thinks will be directly beneficial for learning, rather than engaging generally in networks as a self-evident 'good thing'. On the contrary, the case of Average, which highlights poor managerial skills, provides ample evidence that the absence of such qualities is a hindrance to learning, despite the exposure to a variety of networks. The case of Informal also shows that where there is no managerial capacity, networks are weakly developed and learning is negatively affected.

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<sup>1</sup> It is also clear that age and education level of key managers and technical staff in the enterprise are related to learning as demonstrated by the case studies in chapter 6, but less so by the quantitative survey data.



#### **7.4 All networks are significant, but some kinds of network appear to be more significant than others**

The analysis of study results presented in chapters 5 and 6 shows that although all the different kinds of network studied are significant, some appear to be more significant than others.

##### *Customer and supplier networks*

The results consistently show that customer networks are the most significant of all the networks studied. The ranking of statistical results in chapter 5 (Chi-square and simple linear regression analysis) shows that customer networks are the most strongly associated with the different indicators of technological learning. The qualitative analysis in chapter 6 provides further evidence on the importance of customer networks.

There are reasons why customer networks are so important to SMEs.

Customer networks provide dialogue and feedback on:

- Comparison with other firms and their products in the same or similar areas;

- Product quality and price; and

- Desirable modifications to products and ideas for new products.

Customer networks, therefore, potentially provide a much richer picture to firms that can be achieved via simple market signals in relation to acceptance or rejection of a firm's products. They also give the opportunity for things to be improved or put right before customers are lost. Finally, customer networks can substitute for a good deal of formal R&D.

Of the four kinds of network studied systematically in the thesis, supplier networks seem overall to be the second most significant for the firms. Unlike customer networks, however, their role is less to facilitate learning directly,

and more to facilitate security of supplies in order to secure a good environment in which learning can take place.

### **7.5 Weak supply responses by ESOs make their inputs ineffective**

In view of the weak supply response of the existing services provided by ESOs, it is clear that SMEs in general are not benefiting as much as they should from the organisations that exist. The weak supply response by ESOs is contextualised in this study as network failure. This network failure is manifested by their inability to provide innovative and relevant services to their clients, in particular SMEs. Chapter 4 gives a detailed discussion of the relationships between ESOs and SMEs, which can be summed up as insufficient because the linkages have failed to benefit the latter to a large extent. In chapter 5, the ranking of the benefits firms attach to enterprise support linkages shows that they are perceived least in importance out of the networks studied (see Table 5.2). This corroborates the analysis in chapter 4, where it has been argued that, although the potential impact is high, the relationship between SMEs and ESOs is on the whole weak.

The importance of ESOs to SMEs is compromised by their relative absence in terms of provision of practical forms of assistance and also that only a small number of SMEs are actually accessing these services to any significant extent. However, in chapter 6, the two firms that know (and have the motivation) how to use ESOs use them well. Classic in particular is able to target appropriate ESOs carefully. The third enterprise, Average has also established reasonable relations with ESOs but lacks the capacity to learn from them. There is thus a demand side constraint in this case that overshadows supply side bottlenecks. The fourth firm, Informal which has



little or no capacity to use ESOs is faced with acute demand side constraints as well as supply side constraints.

## **7.6 Firm-to-firm networks do not feature so strongly among the SMEs studied**

Whilst good customer networks are of paramount importance to technological learning among light engineering enterprises in Zimbabwe, study results show that firm-to-firm networks in the same or similar lines of business are not so significant.

The statistical test results (Chi-square and simple linear regression) show that firm-to-firm networks are relatively weakly associated with technological learning and have a low ranking in relation to other networks. Chapter 6 also confirms that SMEs do not use firm-to-firm networks to a very significant extent in comparison with other types of networks.

This absence of strong firm-to-firm relations is an area of concern for the development of a vibrant SME sector. There is a pervasive sense of absence of trust when it comes to forming relations with peer firms which results from fear of opportunistic action by others. The exception is where the basis of trust is high for other reasons such as firm-to-firm networks which are based on kinship relations with a high level of ascribed trust – for example Informal in Chapter 6. Networks of this kind are good, however, as survival strategies for firms, but less so for fostering technological learning. This seems to be because the firms engaging in the networks are all knowledge-poor and have weak capacity to learn. They tend, therefore, to reinforce each other's ignorance.



## **7.7 A ‘package of networks’ is needed by firms but not all networks provide important flows of knowledge to firms at a given point in time**

The evidence from chapters 5 and 6 shows the importance of various kinds of network. The discussion of the different kinds of network above suggests a degree of interdependence, and this is more formally demonstrated by the correlation matrix in chapter 5 (Table 5.4), where there is high multicollinearity among variables used to measure networks. This suggests an important point made in this thesis, which is that the different networks actually reinforce each other and hence firms require a package of networks – no single one by itself will suffice, no matter how well developed. However, not all networks provide equally important flows of knowledge to firms at a given point in its development trajectory.

For firms that make simple products for undifferentiated markets (for example, Informal) – securing long term linkages to customers is critical and growth depends on quality, productivity and increasing volume to meet demand. Beyond this, growth depends on moving into new markets based on development of new applications (for example, in the case of Dynamic; from hinges in metalworking to hinges in furniture). For firms that are addressing more sophisticated markets or are in product sectors with high standards and/or where technical upgrading is taking place, customer relations remain important, but other kinds of networks become highly significant, for example, supplier networks to develop better inputs, and closer enterprise support services for improved technical knowledge.

The case by case analysis of networks in chapter 6 provides further substantiation to this argument. The case studies of Dynamic and Classic, discussed in chapter 6, corroborate the package of networks argument. In the case of Average, overall, a negative trend is observed in the development and quality of networks. The situation of the firm highlights how fragile networks embodied in specific people are and the difficulty of institutionalising such networks. For Informal, only coping networks exist. It is demonstrated both in the cases of Average and Informal that where networks are either poorly developed or absent, the 'development circle' within the firms is incomplete. The case studies of the two firms confirm the package of networks argument, albeit, in a negative sense.

Taking cognisance of the qualifier on the relationship between technological learning and networking, a number of networks are indeed useful, but to varying extents, for the technological learning of SMEs over time. However, while specific networks are by themselves important, their role is emphasized within a broader context of a whole spectrum of other networks to which firms are exposed. This involves interactions with a wide variety of actors within the enterprise and business support system for SMEs. Besides the analyses presented in chapters 5 and 6, the importance of interactions between enterprises and a wide variety of actors is emphasized in the literature chapter 2 by various scholars (Ernst, Mytelka and Ganiatsos, 1994).

## **7.8 Evidence of moving from process improvement to product innovation**

Of the technological learning indicators discussed in this study, those



associated with improving quality and other process improvements seem to have the most significant and sensitive relationship with the networking variables. This implies that the majority of light engineering SMEs in Zimbabwe are currently mainly at the process improvement stage of their innovation capabilities. The stage beyond this concerns product innovation (Forbes and Wield, pp 98 - 102) where a relatively small number of enterprises in the country seem to operate currently. To some extent, Classic and Dynamic illustrate the existence of product innovation characteristics: they have some (albeit limited) capacity to design, develop and market new products. Although the products are not necessarily new to the market, the two firms have shown that they are able to adapt ideas generated from other sources and make changes or modifications to existing product designs to meet the needs of customers<sup>2</sup>.

Generally, however, SMEs in this study are more preoccupied with developing their process and not their product innovation capabilities. Yet both capabilities are crucial to build enterprise competitiveness. The most dynamic firms, most likely those with close ties with enterprise support organisations, move beyond situations where they are preoccupied with process capabilities to develop their innovative capabilities in products. These are the firms that are likely to develop capacity to design new products and continue to make incremental changes that make their products unique and competitive. Again Classic and Dynamic demonstrate the argument well. In fact, the entrepreneur owning Dynamic originally learnt to develop product innovation skills as a technical college trainee.

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<sup>2</sup> 'Other sources' in this case refer to firms already in the business of manufacturing and marketing similar or associated products.



The technical skills were later sharpened with practical experience on-the-job and in the enterprise that he runs. Dynamic has designed, developed and successfully marketed new products over time. The entrepreneur managing Classic has also been exposed to the production processes of various products. In the process, some product innovation capabilities have been acquired. Having accumulated production knowledge and management skills, Classic is attempting, *albeit*, with limited success, to make products and offer services with a unique characteristic and quality. New products have been introduced over time and modifications have been made to many of them to meet customer requirements.

## **7.9 Some policy recommendations that arise from the study**

7.9.1: From conclusions 7.2 and 7.3, it is clear that technological learning is a process that takes considerable time and resources. The cost of learning is shared between the firm and outsiders who include other entrepreneurs and stakeholders in the enterprise support system. From the foregoing, there is need to assist firms, (through some form of facilitation mechanism) to generate basic learning capacities through demand driven, innovative ESO service delivery involving capacity building in enterprises. There must be an enabling policy framework that allows more focused support to the SME sector, specifically designed to unleash the potential of the sector as well as to strengthen the managerial and entrepreneurial capacities of enterprises – to enable firms to engage in both process and product innovation.

Public institutions should take the leadership role in the formulation of relevant policies since it is their mandate to do so. However, the inputs of all

key stakeholders and beneficiaries must be adequately considered in this process if greater success and impact is to be expected. The issue of building a learning culture extends beyond enterprises; it is something that needs to be inculcated in educational and tertiary training programmes at all levels. Informal methods of building a learning culture also need to be considered, better understood and strengthened because as demonstrated in chapter 6, whilst informal networks that are based on kinship are important, they are more useful for coping and survival and not for learning. Yet it can be inferred that potentially, informal networks can make an important contribution to technological learning.

7.9.2: The thesis results have consistently pointed to the importance of customer networks in fostering technological learning. As with other kinds of network, customer networks depend for their effectiveness on good communication. Within this study, communication within networks has been overwhelmingly face-to-face, but such contact is by its nature intermittent unless the network partners are in close physical proximity<sup>3</sup>. Information and communications technologies (ICTs) form a possible medium for additional communication between network partners, especially where they are more dispersed. While not trying to claim that ICTs can substitute for face-to-face meeting, they can nevertheless strengthen good communication through facilitating less intermittent contact in between times. At national level, therefore, a programme for the development and strengthening of the role of ICTs is proposed.

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<sup>3</sup> There is of course a wide literature on industrial clusters that comprise SMEs which is beyond the scope of this study (e.g. Humphrey and Schmitz, 1995; Nadvi, 1995; UNIDO, 1998).



Specific firm level projects, involving specific ESOs with such a mandate can also be supported within this national framework. This suggestion is made in view of the observation that very few Zimbabwean SMEs have access to ICTs – yet globally the role of ICTs is growing for innovative enterprises within a competitive world. For example, out of the four case study firms, only one firm makes extensive use of internet services. None of the SMEs studied had a functional website address at the time of conducting this study. Even the one firm that uses the internet, there is no evidence that such services are being exploited to develop relations with customers (or any other networks). Moreover, given the general need for effective communication in networks, ICTs can be utilised to strengthen all the networks which are shown in this thesis to be important to firm development.

7.9.3: The general failure of ESOs makes it imperative to examine other mechanisms by which ESOs can operate and support enterprises that are different from their traditional mechanisms. There is need for a re-thinking of the role of ESOs to create a situation that would result in synergies being forged through coordinated efforts between the wide variety of support organisations and SMEs.

One recommendation concerns making ESOs more pro-active so that they reach out more to SMEs which do not have the capacity to reach out to them. Another concerns facilitating firms to gain the capacity to gain advantage of their services. There is need for SMEs to clearly recognise that for them to become competitive, efforts in both process improvements and product innovation hold the key to success; for ESOs, the bridging of identified support services gaps is crucial. However, sequencing is required so that initially support services concentrate on process improvements for



most SMEs. A few firms with a particular drive and orientation may be targeted for product innovation. As the development process takes place, more efforts can be placed on product innovation on an incremental basis.

New approaches by ESOs which enable them to forge the necessary synergies that are essential for more effective service delivery are required.

New policy guidance is required in this area, which has to be followed up by the formulation and implementation of practical strategies in support of such an endeavour. This change oriented approach must necessarily involve a variety of stakeholders, both state and non-state actors.

7.9.4: There is need for the development of a facilitation mechanism to strengthen the building of relations and trust between SMEs through sustained interactions, exchange visits, sharing of lessons, training, capacity building and joint development of best practice, which could be mounted by ESOs. More direct cooperation involving sub-contracting arrangements between enterprises and sharing of common resources are other mechanisms that can be facilitated as a building block for strengthening trust and confidence between enterprises. The implementation of and support to best practice approaches that allow SMEs to generate trust in each other through cooperation and collaborative activities is suggested in this case. This necessarily involves efforts that are clearly targeted to achieve specific outputs.

7.9.5: Finally, depending on specific conditions and identified priority needs, policy considerations for developing SMEs must be holistic and not involve only some aspects leaving out key areas of potential intervention. Firms and ESOs need to learn how to prioritise key actions so that there is a logical sequencing of provision of the inputs required. Understandably, not all the

key expected outputs can be targeted for achievement all at once. The planning process must be able to identify the resources and activities that need to be mobilised at every stage for certain expected outcomes to be realised.

#### **7.10 Possible areas for further research and action**

This thesis supports the argument that networking in its various forms is important to the development of light engineering SMEs in Zimbabwe, in particular in relation to technological learning, which is critical for the development of competitiveness. It suggests also some areas for further research as follows:

1. Given that the thesis covers only one sub-sector of manufacturing SMEs, there is scope to do a comparative study with other sub-sectors in which manufacturing SMEs are engaged. Examples include textiles and clothing, woodworking and furniture, automotive engineering, maintenance and repair. The results from a broader study will help give a sense of the extent to which the analysis provided here is generalisable across a wide range of manufacturing SMEs.
2. A second area for comparative research, and which again relates to the generalisability of the analysis of this thesis, is to study manufacturing SMEs, networking and technological learning in other Southern Africa countries.



3. Given the mandate of enterprise support organisations (ESOs), but also their relative ineffectiveness, interesting future research might analyse innovative policy experiments in the use of ESOs for SME support. Such research would have the following objectives:
- To identify appropriate ways of facilitating and strengthening innovation networks and linkages between SMEs and their key service providers, especially those ESOs with a technological learning agenda.
  - To ascertain the effectiveness and potential of ESOs in terms of production, dissemination and sharing of knowledge for the development of productive enterprises.
  - To evaluate the possibilities for ESOs to support technological advancement at local firm level through the establishment of demand driven linkages which are sustained in the short, medium and long term.
  - To identify ways of contributing to the formulation and implementation of innovative technological learning approaches for the development of productive enterprises. At local country level, this might entail a development process leading to the revision of existing policies and strategies. New methodologies of dealing with SMEs to foster the emergence of more dynamic and vibrant enterprises which are globally competitive can also be a key result of such an effort.
- The methodologies can be considered by policy makers, ESOs and other practitioners engaged in the development of productive enterprises.



### **7.11. Concluding remark**

The thesis has tackled, in a modest way, specific issues that are of relevance to the development of productive enterprises in an African, specifically Zimbabwean, context. The fact that over the past decade there has been growing interest in the development of SMEs with several programmes initiated to support them, *albeit*, with limited success, poses a challenge. There is an expectation that this thesis will contribute to the re-thinking of the development of SMEs in the country, quite apart from the possible academic contribution the research might make currently and in the future.

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**APPENDIX A: THE SCATTERPLOT DATA**

Data in the scatterplot diagrams of technological capability (TC) and networking quality (NQ) composites for survey firms. Figures in bold relate to case study firms.

Firm code <sup>1</sup>	NQ composite (%)*	TC composite (%)*
1	65	62
2	60	53
3	84	75
4	50	56
5	60	88
6	55	54
7	60	54
8	50	64
9	60	53
10	70	52
11	40	59
12	90	58
13	90	85
14	45	44
15	34	35
16	60	73
17	55	57
18	40	39
19	55	43
20	60	43
21	55	47
22	35	30
23	75	65
24	70	61
25	75	70
26	40	52
27	30	37
28	75	61
29	35	48
30	80	80
31	55	30
32	55	46
33	35	41
34	50	37
35	65	64
36	30	19
37	30	34
38	25	42

<sup>1</sup> This represent s the identity of survey firms.

# APPENDIX B: COMPUTATION OF THE NETWORKING AND THE TECHNOLOGICAL CAPABILITY COMPOSITES

Networking Quality Composite = Enterprise Support Linkages + Customer Linkages+ Supplier Linkages + Firm to Firm Linkages (Each linkage quality is scored from 0 - 5; 0 being lowest, 5 highest)

Technological Capability (TC) Composite = f (PQ, NP, R&D, QM, P, A1, A2, A3), where:

- PQ is product quality
- NP is new products (including adaptation of existing products)
- R&D is research and development
- QM is quality management
- P is productivity
- A1+A2+A3 is the adaptation index (Process adaptation)

- Major process adaptation (A1) = new equipment + major work organisation changes
- Medium process adaptation (A2) = new equipment + minor work organisation changes
- Minor process adaptation (A2) = modifications to existing equipment

Adaptation index = composite of major, medium, minor process adaptations, weighted as follows:

$$\begin{aligned}
 \text{Index} &= \frac{(3 \text{ (major score)} + 2 \text{ (medium score)} + \text{minor score})}{6} \\
 6 &= \frac{\text{Theoretical maximum}}{3} \quad (3 \times 3) + (2 \times 3) + 3 \\
 &= 18
 \end{aligned}$$

This will give weighted index on a scale 1 - 3



**APPENDIX C**

**SURVEY INSTRUMENT (QUESTIONNAIRE) FOR PHD RESEARCH**

Enterprise No.

Date of Visit

Day

Month

Time

Interviewer:

Location

Name of the Firm

Postal Address

Physical Address

Telephones:

Fax number:

E-mail:

Respondent: Name:  Position

Contact Person:

Gender of Respondent: Male.....1; Female.....

Age of Respondent: (Years)

**BACKGROUND DATA**

When did the firm start operating (Number of years operating)

How business was acquired or established (brief description)

Major changes in investment (years)

Source of funding of start-up capital: (*Bank Loan = 1; Personal Savings = 2; Borrowed from friends = 3; Special Institutional loan = 4, Other (specify) = 5*)

1. Give a draft of the company's organisational structure (organogram)

What is the ownership status of the firm ?

	% ownership
Local Domestic	<input type="text"/>
Public	<input type="text"/>
Foreign	<input type="text"/>
Joint Venture	<input type="text"/>
Other (Specify) _____	<input type="text"/>

2. What is the legal status of the firm ?

Sole Proprietorship.....	1	
Partnership .....	2	
Limited Liability Enterprise .....	3	<input type="checkbox"/>
Co-operative .....	4	
Subsidiary of Zimbabwean Firm.....	5	

3. What is the racial origin of the Zimbabwean owners ?

African .....	1	
Asian .....	2	<input type="checkbox"/>
European .....	3	
Other .....	4	

(Specify: \_\_\_\_\_)

*(Questions to be addressed at major shareholders/owners and senior managers only)*

4. Did you have previous experience in this industry ? (Yes.....1; No....2 ☐

5. How many years of experience did you have in this industry prior to acquiring this business ?  years

6. How many of your staff had previous experience in this industry prior to joining your firm ? *(Specify staff levels and capacities in which employed within your firm)* ☐

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7. List the products or services offered by your firm in order of priority :

Product/service	% of contribution to revenue	% domestic market	% for exported
i _____	<input type="text"/>	<input type="text"/>	<input type="text"/>
ii _____	<input type="text"/>	<input type="text"/>	<input type="text"/>
iii _____	<input type="text"/>	<input type="text"/>	<input type="text"/>
iv _____	<input type="text"/>	<input type="text"/>	<input type="text"/>
v _____	<input type="text"/>	<input type="text"/>	<input type="text"/>

8. What were your firm’s sales, value and inventories of your manufactured products for select years ?

	1997	1998	1999
Output sales/values (Z\$)			

9. What percentage of your raw material inputs is imported ? (%)

10. HUMAN RESOURCES AND TRAINING

10.1 Human Resources Capacity Situational Analysis

	Situation at start-up	Current Status
(a) Number of full-time paid employees ?	<input type="text"/>	<input type="text"/>
(b) Number of casual/part-time employees ?	<input type="text"/>	<input type="text"/>
(c) Number of contract employees ?	<input type="text"/>	<input type="text"/>
(d) Total employees/personnel ?	<input type="text"/>	<input type="text"/>
(e) Number of full-time <u>production</u> employees ?	<input type="text"/>	<input type="text"/>
(f) Number of full-time <u>administration</u> employees ?	<input type="text"/>	<input type="text"/>
11a. Number of <b>skilled</b> production workers ?	<input type="text"/>	
b. Number of <b>semi-skilled</b> production workers ?	<input type="text"/>	
c. Number of <b>unskilled</b> production workers ?	<input type="text"/>	



12. Give the details of the number of degree, diploma, certificate holders and apprentices, etc.

Category:	
University degrees in engineering	
Diplomas from technical colleges	
Certificates from technical vocational training institutions	
Accountancy/management qualifications	
Apprentices	
Secondary education only	
Primary education only	

13a. What in-house staff/employee training programme do you have ?  
*(Ad hoc....1; Planned training scheme.....2; Both planned and ad hoc....3* ☐  
*No training at all.....4)*

b. If there is some form of in-house staff training within the firm, how do describe it ☐  
*(Excellent/very good....1; Good.....2; Average/satisfactory....3; Poor.....4*

13. What was the total amount spent on employee training (including trainer's fees and expenses, training materials and personnel trainees expenses) in the past year Z\$

## 15. RESEARCH AND DEVELOPMENT (R & D)

a. How has the firm been involved in R & D activities (excluding routine maintenance and quality control) ? (Not at all = 0; poor = 1; Average = 2; Good = 3; Very Good = 4; Excellent = 5)

b. Amount (Z\$) spent on research and development activities

1997	1998	1999

c. Has your firm introduced any new products through in-house R & D over the past 3 years ? (Yes = 1, No = 2) ☐

d. What changes have you made to your main products over the past three years (product adaptations; indicate level, i.e., if high, medium or low) ?

e. Products dropped in the past three years ?

f. What is the rejection rate of your products

	%
Currently	
2 years ago	
4 years ago	
At start-up (first year)	

g. What major obstacles does the firm face in R & D activities ?

1.\_\_\_\_\_ 2. \_\_\_\_\_ 3 \_\_\_\_\_ 4 \_\_\_\_\_

h. Does the firm have a unit/section or personnel whose primary responsibility is continuous productivity improvement for the firm ? (Yes...1; No...2 ☐

i. What type of productivity improvement activities are carried by your firm ?

j. Give the number of personnel involved in productivity improvement activity (in full time equivalents)

16. PROCESS ENGINEERING CAPABILITIES

a. Do you have an established quality control mechanism ?(Yes...1; No...2)

b. Does company have specific personnel whose primary responsibility is to examine or look at issues related to quality ? (Yes...1; No...2)

c. Do you have a record of acceptance or rejection of products (Yes...1; No...2)

d. To what extent is management exercising control on matters related to quality ? (Low priority = 1; Average = 2; High = 3)

e. To what extent are the firm's production staff committed to issues related to quality ( Low priority = 1; Average = 2; High = 3)

f. Does the firm stress the need for quality awareness and continuous improvement ?  
(Yes...1; No...2) ☐

17. MAJOR CONSTRAINTS FACED BY THE FIRM

a. To what extent does the firm have problems in the following specific areas ?

	Very major problem	Major problem	Moderate problem	Little problem	No problem	Trend -
Finance						
Marketing (including getting new products in the market))						
Raw material supplies						
Human resources and or skilled personnel						
Technological support services						
Delivery (meeting specified schedules)						
Product pricing (failing to cost products well)						
Product rejection rate (customers refusing to accept products)						

b. Where major problems are faced, further elaboration is needed below

18. NETWORKING AND LINKAGES

a. List of organisations you are associated with Trend  
(exclude other firms)



b. List your firm's key associates  
*(include suppliers, other similar firms in the same sector)*

Reason

_____	_____
_____	_____
_____	_____

c. Describe and elaborate on any benefits derived from each of the associations or linkages (include both formal and informal networks) ?

(i) Technology development institutions (include any major enterprise support programmes)

_____
_____
_____

(ii) Input markets (suppliers of raw materials/inputs)

_____
_____
_____

(iii) Product markets (customers/clients)

_____
_____
_____

(iv) Linkages with SMEs occupying the same value chain (horizontal associations)

_____
_____
_____

(v) Linkages/associations with large firms, including sub-contracting arrangements

_____
_____
_____

d. On a scale 0 – 5, rank the importance of the following linkages or associations.  
*(0 = not useful; 5 = highly useful or valuable, implying the best possible score that could be attained)*

(i) Technology development institutions	<div></div>
(ii) Input markets (raw material suppliers)	<div></div>
(iii) Product markets (customers)	<div></div>
(iv) Linkages with other SMEs	<div></div>
(v) Linkages with large firms	<div></div>

e. Describe firm's involvement in the following:

	Does not engage	Excellent	Very good	Good	Average/ Satisfactory	Very poor	Trend -
External consultants							
Foreign expatriates							
In-service training							
Sub-contracting							

f. Describe your firm's relationship with the following:

	Very major problem	Major problem	Moderate problem	Little problem	No problem at all	Trend -
Customers						
Raw material suppliers						
Technical training programmes						
Entrepreneurial development programmes						
Financial institutions						
Professional technical associations						
R & D institutions						
Industrial and trade associations						
NGO or special enterprise support programmes						

g. Elaborate on any particular problems you may face with each or any of the networks/associations\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## 19. TECHNOLOGY ACQUISITION/EFFORTS

- a Do you have a foreign technical assistance contract at present ? ☐  
(Yes.....1; No.....2)
- b Has your firm made any major additions to production capacity since initial investment ? (Yes....1; No....2) ☐
- c When did the investment take place ? Year
- d How much did it cost ? Z\$
- e Was the equipment new or used ? (*new...1; used.....2 ; mixed....3*) ☐
- f Was the equipment imported or locally produced ?  
Foreign (100%) .....1  
Mostly Foreign/Some Local..2 ☐  
Local (100%).....3  
Mostly Local/Some Foreign...4
- g What was the purpose of the investment in equipment ?  
Produce same product,  
    Improve process.....1  
Produce same product,  
    Add to capacity.....2  
Introduce new products.....3 ☐  
Produce different variety  
    Of similar product.....4  
Replace old equipment with  
    Similar one.....5  
Other (specify).....6
- h Was the investment in new equipment accompanied by an active acquisition of additional skills and expertise 'soft technology' by staff to master the equipment or to improve the production process ☐  
(Yes.....1; No.....2)
- i Has the cost of production (per unit of output) changed with the new equipment or innovations (*innovations defined in wider sense beyond use of specific equipment or machinery*) ?  
It is higher than before .....1  
It is about the same as before.....2 ☐  
It is lower than before.....3
- j How has the quality of the product changed with the new equipment or innovations ?  
It is higher than before .....1 ☐



- It is about the same as before... ...2  
 It is lower than before..... .3
- k Did you carry out any technical adaptation to the equipment ? ☐  
 (Yes...1; No...2)

20a. How do you rate the firm with respect to the following areas ?

Indicator	Excellent	Very good	Good	Average/ Satisfactory	Very poor	Trend -
Production planning and control						
Product quality (In-house quality control systems)						
Product pricing						
Delivery (meeting specified schedules)						
Management routines						
Product diversity/range						
Design capabilities						
Productivity						
Continuity of innovation process (continuous improvement)						
Location of production units						
Human resources potential						

20b Elaborate on any particular problem areas or specific constraints as highlighted

21. Technological learning and networks

			Processes			
	Quality		Productivity	Quality of adaptations/changes		
	Product Quality (PQ)	Quality control mechanisms in place (QM)	Self-perception (P)	Major (A1)	Medium (A2)	Minor (A3)
Present						
1 year ago						
2 years ago						
3 years ago						
4 years ago						
5 years ago						

*(Insert new products (NP) introduced over time - including adaptation of existing products); extrapolate from previous question, 15d.*

22. Suggested data analysis: networking data

	Enterprise support organisations	Suppliers	Customers	Firms in similar business
	Quality of linkages	Quality of linkages	Quality of linkages	Quality of linkages
Present				
1 year ago				
2 years ago				
3 years ago				
4 years ago				
5 years ago				

Notes

Networking index for each type of network = f (number of linkages, quality of linkages);  
Number of linkages in turn = f(formal linkages, informal linkages)  
Quality of linkages can be done on a self-assessment scale (0 - 5); 5 being highest; 0 being lowest. It is noted that data relating to number of linkages was captured but was found to be not so useful and hence skipped in the analysis.

## APPENDIX D: CASE STUDY CHECKLIST - SEMI-STRUCTURED SCHEDULE

### Background of firm

How firm was founded or how business was acquired (*from survey data*)

Ownership status of firm (*from survey data*)

Original owners of firm (*from survey data with a bit*

Experience of owners/key staff in similar or same business

Education/training background of owners and key staff

Any distinctive competencies of staff or management of the firm (how the skills or competencies were acquired) on the job or otherwise

Products produced (range) over time and production processes

### Associations/linkages information

Nature and character of linkages/associations with the following:-

Technology oriented agencies/programmes (technology transfer, R & D institutions, technological training or skills development (public and private)

General business development services (incorporating training or entrepreneurial development programmes - both public and private)

Financial/credit institutions (formal and informal)

Informal contacts perceived to have important 'value added role'.

*(Differentiate specialised linkages with particular recognised value added role as a result of their sustained nature and depth from generalised linkages which may be 'once off' or casual and as such may not make much difference to the firms)*

Elaborate on specific linkage activities (how the firm benefits or otherwise from the linkages; depth of the linkages (qualitative elaboration of the associations in terms of value addition to firm) - How the associations/linkages emerged?

How long linkages have existed? Any specific trends on how linkages are developing within specific areas/aspects.



Depth of the associations and whether they are making any qualitative differences to the firms. Any changes to firms' behaviour resultant upon specific types of association(s) or linkages?

Firm-to-firm cooperation activities (e.g., in terms of major advice from customers, suppliers and any other collaborating firms possibly within similar line of business, etc., ) - What are the cooperation activities, in what areas, how and why they exist or were developed?

Elaborate on the importance and any particular problems experienced with various kinds of associations (extent of the problems)

Role of informal networks - evolution, strength. With whom are these networks established (e.g., firms within similar line of business or not, relatives or friends in business, neighbouring enterprises.

Basis of networking - specify areas of networking, how, and why. Are the informal networks sustained, planned or ad hoc.

### **Learning capability information**

How has firm (owners, senior managers, other personnel) accumulated technological and associated knowledge over time (assuming there has been some learning that has taken place over time? What specific examples of learning are there? This needs elaboration with particular examples.

What specific examples of learning/innovation that derive from a networking contact (or contacts). There is the opposite extreme of where the firm has not taken on ideas originating in networking contacts. In each case, an attempt is made to try and get the firm to describe the detailed process – the 'hows' and 'whys'.

Level of the firms' initial technological status - knowledge base vs current level. Where was firm's technological level some years ago (depending on when started operating)? What is the situation now in relation to previous years?

Any growth in 'technological resource endowment' over time, how and in what areas.

Has this been a result of some kind of formal or informal learning or both? If no growth in technological learning is demonstrated, why is it so?

Differentiate technological learning capability of firms using some kind of 'measurement criteria'. Such criteria might include the following:-

- changes to human resources capability in mastering new methods of production
- use of new equipment/machinery; production capability/capacity
- ability to produce new or innovative products with an identifiable market whose requirements may have been changing over time
- ability of firms to adapt and adjust to changing customer needs
- ability to expand product range to meet specific market niches.
- All key changes need to be spelt out. How have the changes been effected, why and by who?. Any external facilitation or not? If yes, what form did such facilitation take?

APPENDIX E: GLOSSARY OF STATISTICAL TERMS

The following is a glossary of terminology used in the quantitative analysis (de Vaus, 1996).

The glossary

*Bivariate analysis:* a general category of analysis in which two variables are analysed simultaneously in order to examine the relationship between the two variables.

*Chi-Square Test (t-test)*

This tells us the probability of getting a disagreement between observed and computed frequencies equal to or greater than that observed, in either direction. The test consists of summing a series of ratios, each ratio having been obtained by: (1) taking the difference between an observed frequency (*f*) and an associated population or computed frequency (*f<sub>c</sub>*), (2) squaring this difference, and (3) dividing the squared difference by *f<sub>c</sub>*.

Coding

The symbols used to represent categories of a variable (e.g. 1 = male; 2 = female). Although these symbols are usually numeric (numbers), alphanumeric (letters) characters may be used.

Correlation Matrix

A grid in which each column and each row represents a variable. The intersection of each column and row is a correlation co-efficient of the column and row variables. It is used to measure the strength of the visual expression. Correlation coefficient ranges between 0 – 1; 0 means no association, 1 means 100% association.

Cross Tabulation

A table consisting of rows and columns. The columns represent the categories of one variable while the rows represent the categories of another variable. The intersection of a column and a row produces a cell which represents cases having the attributes of both that column and that row. This analysis is deeper than correlation because it tells the depth of what is observed about firms with respect to certain variables with the application of statistical significance tests.



**Dependent Variable**

The variable, frequently referred to as the Y variable, that is assumed to be the effect in a 'cause-effect' relationship.

***Independent/Explanatory Variable***

Frequently referred to as the X variable, it is the assumed *cause* in the 'cause-effect' relationship.

***F-test***

The F-test is used to check the statistical significance of R-squared or the explanatory power of the regression model.

**Linear Relationship**

A relationship between two ordinal or interval variables in which a change in one variable is related to a change in the other variable in a consistent direction. As one variable increases, the other increases or decreases at a consistent rate.

***Multicollinearity***

This is a statistical problem generated in multiple regression analysis where strong correlations between independent/explanatory variables distort the regression model results. Strong multicollinearity is undesirable because it makes multiple regression coefficients insignificant, often carrying wrong or reversed signs combined with an inflated model explanatory power as measured by R-squared, the multiple coefficient of determination.

**Null Hypothesis**

A hypothesis that states that there is no relationship between two variables in the population from which the sample is drawn. A null hypothesis is used in statistical inference where we begin with the assumption of no relationship and seek, via tests of statistical significance, to *reject* it. If we can reject the null hypothesis we assume a real relationship in the population.

**Pilot Testing**

A test run of a set of questionnaire items to detect problems with the questions and questionnaire design.

**Regression Co-efficient**

A co-efficient used in regression analysis that estimates how much the dependent variable changes for each unit change of the independent variable.

**Scattergram**

This is a graphical representation of the relationship between two interval level variables in which each case is represented by a point. It measures visual expression of associations between variables.

**Regression**

A method for describing the relationship between two or more interval level variables. It estimates the impact of one variable on another (i.e. how much does the dependent variable change for each unit change of the independent variable?, evaluates the relative impact of various independent variables (beta weights) and predicts the value of the dependent variable under various conditions. Regression strongly depends on non-statistical understanding of the situation in determining what causes what. It tells the researcher the variables to be influenced by policy by sifting through many variables.